OFFICIAL PUBLICATION OF THE PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

DECEMBER 24, 1951
VOLUME 40, No. 26

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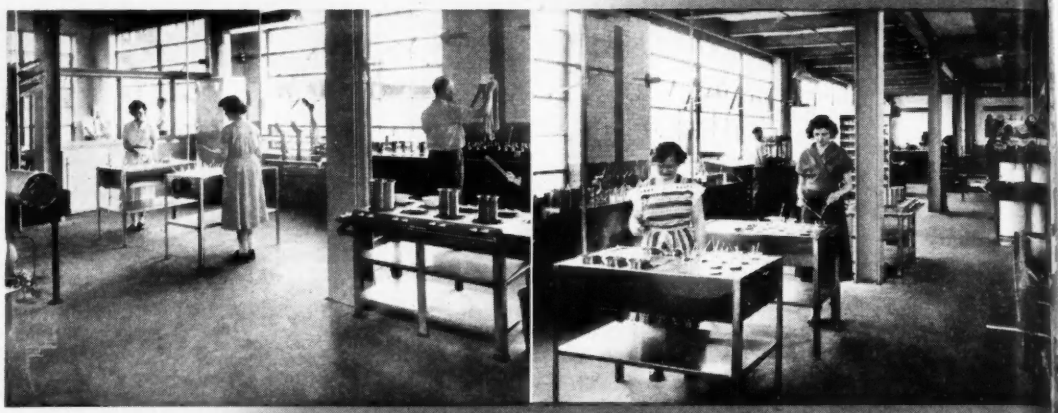

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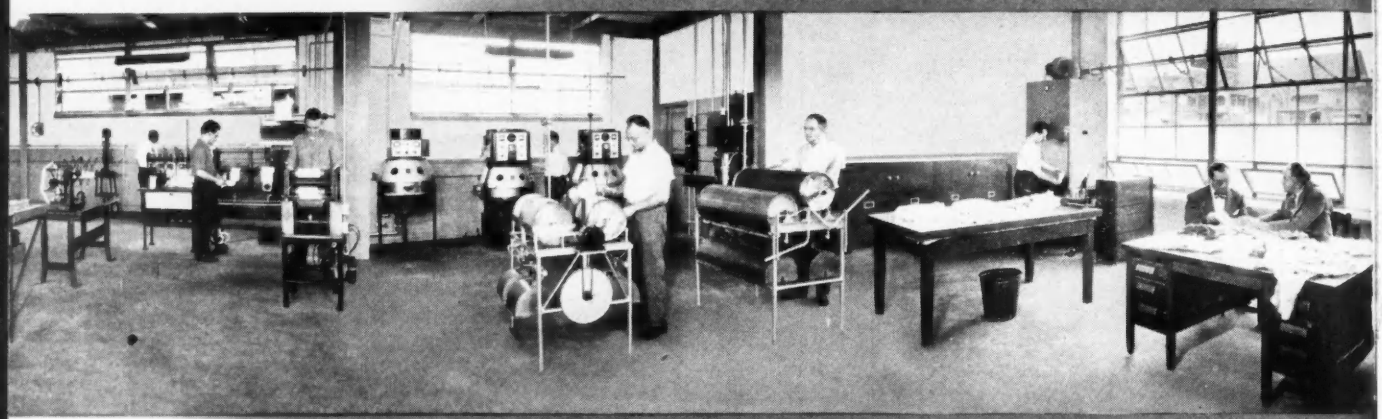

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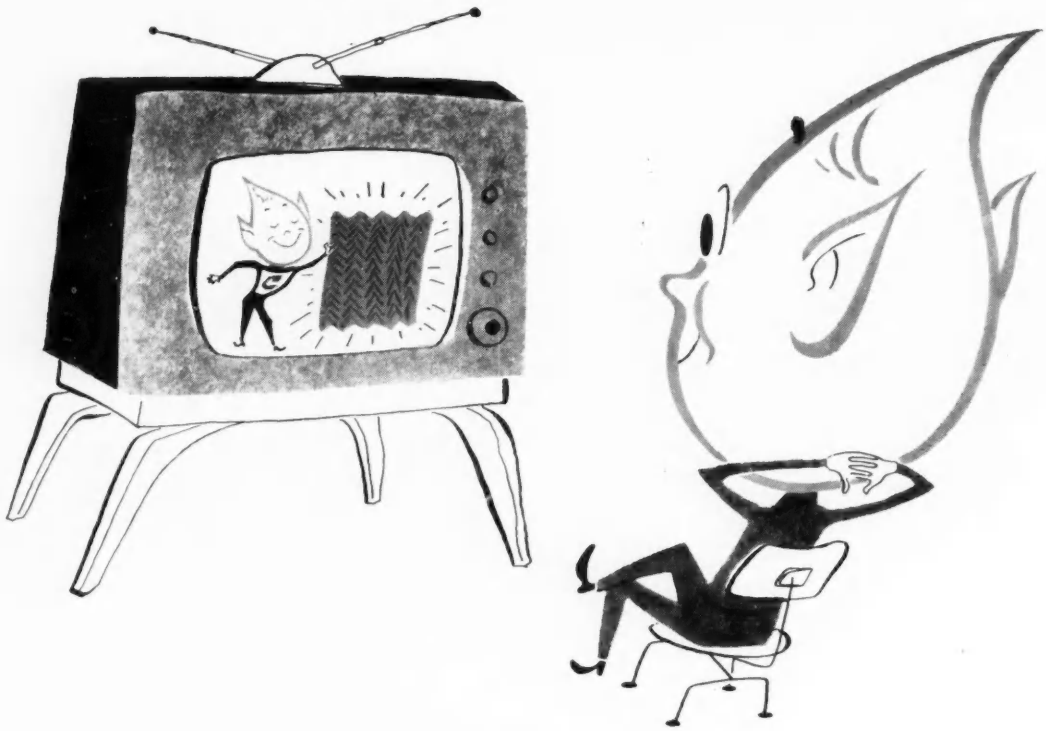
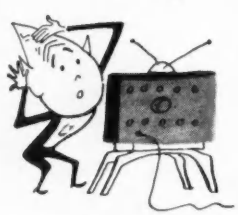


"Cal" Sees Himself as Others See Him

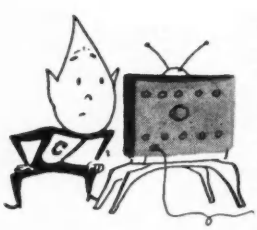
Cal was lolling in front of the TV, his long spine bent in a comfortable curve. He drowsed. Suddenly he came awake at the word "soap" to find himself in the midst of an educational film describing a textile mill.

"Oh, no!" he groaned as the camera took an angle shot down into a milky, murky tank of water. "Haven't they ever heard of me? What'll I do, what'll I do? Lime soap all over the goods and I have to sit here and watch!"



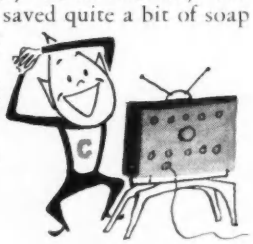
All this time the carefully cultured voice of the narrator was going on and on about how the fabric was washed with soap "just as carefully and thoroughly as a good housewife would do it." "Well, why don't you use Calgon like a good intelligent housewife?" screamed Cal.

He was in danger of dissolving in his own tears when the camera shifted. Here came a young chap with a bucket. He peered into the tank then poured into it the contents of the bucket. Cal was tense with anticipation. Second by second, he watched as the scum gave way to floating suds, the water cleared, and the greasy ring around the tank began to dissolve.



The smooth voice from the TV set went on. "To produce clear, even shades of color on our goods, we make the water for washing softer than soft by using Calgon to prevent sticky lime soap deposits and to help the soap do its cleaning job."

Cal leaped to his feet and made like an animated chelate ring as he shook hands with himself. "Just a bit slow getting me into the act," he commented, "but they'll be O.K. now. Could've saved quite a bit of soap if they'd given me first crack at the calcium and magnesium."



For full information on this and other applications of Calgon in the textile industry, send for the bulletin "Calgon Data for the Textile Chemist."

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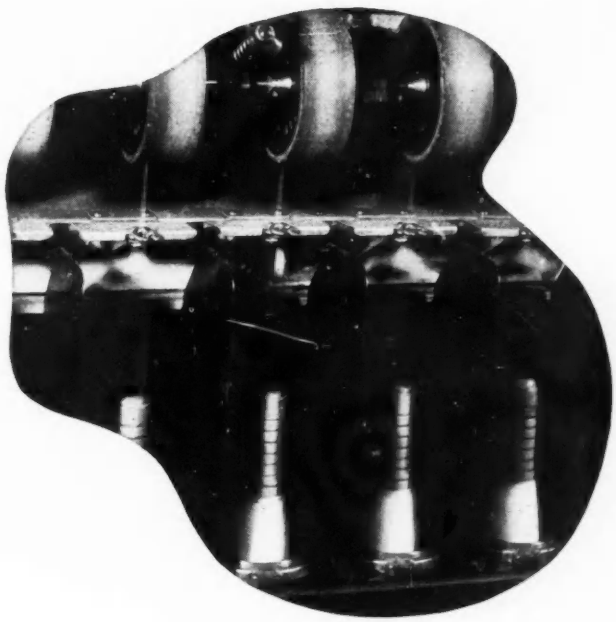

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MILL D—50-50 wool-Dynel blend. Applied 1% Syton, 2½% oil (based on weight of wool) to blended stock. Spun to 6 run. Good control of fibers, smooth, uniform yarn noted.

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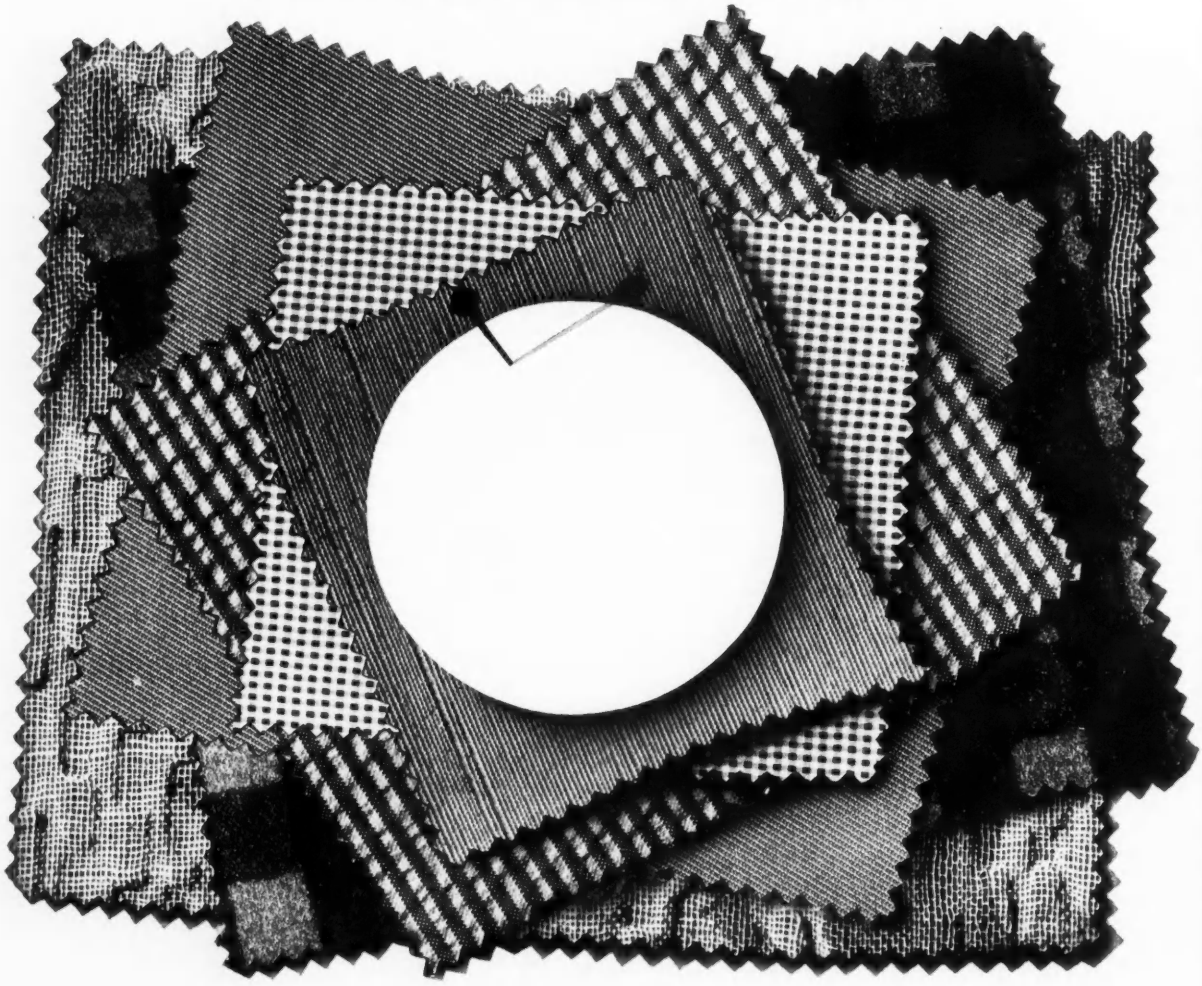

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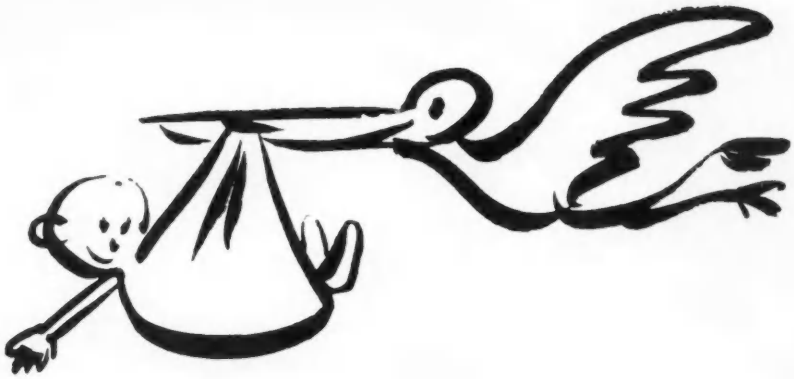

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VOLUME 40 NUMBER 26

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DECEMBER 24, 1951

ELECTION RESULTS 1952 AATCC OFFICERS

Results of the recent mail ballot for 1952 officers of the AATCC have been announced as follows:

President—C Norris Rabold (reelected)

Vice Presidents (by regions)

New England—Raymond W Jacoby
Central Atlantic—Arthur W Etchells
Southern—Samuel L Hayes
Western—Arthur T Brainerd

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Raymond W Jacoby
Vice President (New England)

Arthur W Etchells
Vice President (Central Atlantic)

Samuel L Hayes
Vice President (Southern)

OLNEY MEDAL CANDIDATES

THE Committee of Award would like suggestions regarding candidates for the Olney Medal Award of 1952. These should be in the hands of H C Chapin, secretary of the Association, not later than March 1, 1952. Data on the accomplishments of candidates should be specific in such matters as journal references or patents, but all definite information will be helpful. Letters from several sponsors of one candidate are needless, except for giving additional data.

Under the rules the basis of award is outstanding achievement in the field of textile chemistry, which is understood to include the development of chemical agents or chemical processes used in the manufacture of textiles or methods of evaluation.

In making awards, the Committee need not be confined to the consideration of any one specific achievement or contribution, but may in its discretion consider the sum total of various and continued contributions to the field, no matter of how long duration.

The citation of the award drawn by the Committee and accompanying the presentation of the medal shall set forth clearly the occasion for the award.

The voting members of the Committee are Harold W Leitch, *chairman,* William D Appel, Henry A Rutherford, Raymond W Jacoby and C Norris Rabold, president of the Association, ex officio.

Arthur T Brainerd
Vice President (Western)

Report of a Research Committee Desizing——

THE PERCHLORIC-ACID METHOD FOR THE DETERMINATION OF STARCH AND SOME PRACTICAL APPLICATIONS*

W G SINK † and D L WORTH
Mooresville Mills, Inc.

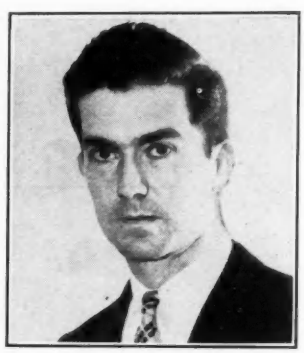
INTRODUCTION

Finishing-plant laboratories are quite often faced with the problem of determining small quantities of starch left in fabrics after desizing. The usual method for this determination consists of obtaining the initial bone-dry sample weight, liquefying the starch with enzyme or dilute hydrochloric acid, washing with hot water, obtaining the final bone-dry sample weight and calculating the percentage of starch by the loss in weight. During washing and physical handling, fiber and noncellulosic losses are unavoidable. The losses are often partially accounted for in the case of sized yarn by running a blank determination on unsized yarn, but usually unsized fabric samples are not available. When small quantities of starch (1% or less) are involved, the above method does not give even a good approximation.

This report involves a continuation of the work of McEwen *(1)* on a colorimetric method for the determination of starch, which consists of disintegrating the sample with perchloric acid, neutralizing with caustic soda, adding excess acetic acid, adding potassium iodide and potassium iodate solutions to liberate iodine, placing solution in cell of photoelectric colorimeter, interposing a red filter, reading, discharging iodine color with sodium thiosulfate, reading colorimeter again, subtracting second colorimetric reading from the first reading and determining the percentage of starch by referring to standard graphs. McEwen recommends a solubilizing time of 30 minutes in 42% perchloric acid at room temperature as giving the best results.

PROCEDURE

The method reported here differs from that of McEwen as follows:



D L Worth

A modification of McEwen's colorimetric method for the determination of starch in fabrics is presented and discussed. Application of the method in the analysis of known quantities of converted starch indicates the method is accurate to within 5% or less even when very small quantities of converted starch are involved. The presence of urea-formaldehyde resins or fats does not interfere with the determination, but the method does give the percentage of locust-bean gum present along with the percentage of converted starch. Illustrations of how the method may be used to evaluate the optimum temperatures and pH values of enzymes used in desizing are given and discussed.

1. After being dissolved in perchloric acid, the entire sample is neutralized with caustic soda so that the determination may be stopped at this point and continued on the following day if necessary. The data in Table I were obtained by completing the analysis of several samples on the first day and then duplicating the analysis on the neutralized samples on the second day. The analysis on the second day appears to be just as accurate as the analysis on the first day.

2. 2 ml of 0.05 *N* KIO_3 is added in the development of the iodine color instead of 5 ml of 0.01 *N* KIO_3, or twice as much KIO_3. The % transmission of the solution is still decreasing fairly rapidly when 1 ml of 0.05 *N* KIO_3 has been added but has leveled off when 2 ml of 0.05 *N* KIO_3 has been added (see Fig 1). Further additions of iodate solution do not cause any appreciable decrease in transmission. The addition of this extra amount of iodate makes it unnecessary that the solution be standardized so precisely or that additions be made so accurately. There is therefore an overall increase in accuracy of the determination.

3. As the solution is filtered after neutralization, a blank colorimeter reading on the turbid sample becomes unnecessary. The complete procedure is as follows:

1. Obtain bone-dry weight of sample (5-10 grams).

2. Cut fabric samples into small squares and transfer to a 100-ml beaker, making sure that all small particles are transferred to the beaker.

3. Add sufficient 42% perchloric acid solution to cover sample (approximately 30 ml) and allow to stand at room temperature for 30 minutes with frequent stirring.

4. Add 100 ml of distilled water and a few drops of phenolphthalein; then add 6 *N* NaOH solution until the solution just changes to a pink color. Discharge the pink color with a few drops of 2 *N* acetic acid.

5. Filter the solution and transfer it

TABLE I

Sample Number	Grams Starch Gum Padded On	Grams Starch Gum by Analysis: First Day	% Error	Second Day	% Error
1	4.85	4.98	2.7	4.66	3.9
2	3.88	4.04	4.2	3.92	1.0
3	2.95	3.10	5.1	2.99	1.4
4	1.94	2.06	6.2	2.03	4.6
5	0.97	1.01	4.1	1.03	6.2

* Presented by D L Worth before a meeting of the Desizing Research Committee at the 30th National Convention in New York on October 16, 1951.

† Present address: Fischer Scientific Co, Pittsburgh, Pa.

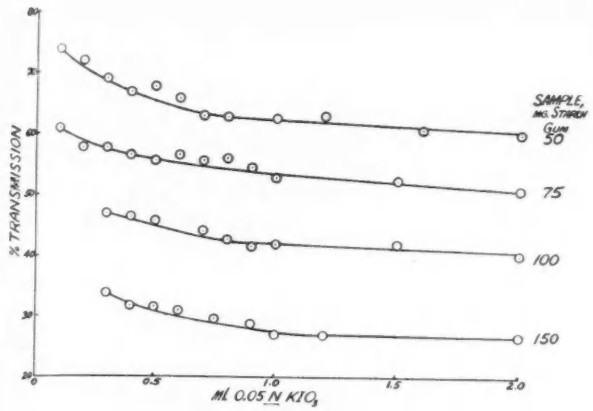


Figure 1
Effect of Volume of 0.05 N KIO_3 Added During Perchloric Acid Starch Determination on the Colorimeter Reading of Various Starch Solutions.

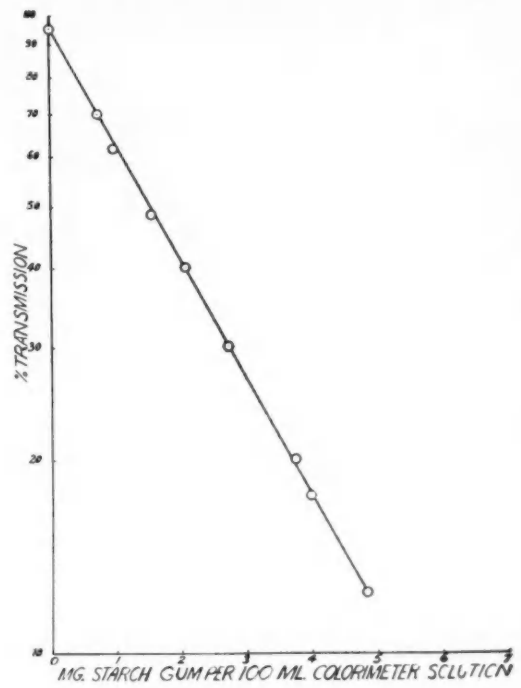


Figure 2
Colorimeter Readings of Various Starch Gum Solutions.

to a 250-ml volumetric flask. Add distilled water to bring the volume up to the mark. At this point the solution may be safely left overnight.

6. An aliquot sample of sufficient volume to contain from 1.5 to 3.5 mg of starch or starch gum is taken and placed in a 100-ml volumetric flask. The volume is made up to about 50 ml, and 2.5 ml of 2 *N* acetic acid is added. 0.5 ml of 10% KI solution and 2 ml of 0.05 *N* KIO_3 solution are accurately added. The solution is diluted to 100 ml, thoroughly shaken and allowed to stand for 10 minutes.

7. A Fisher Electrophotometer with a red filter is standardized with distilled water. The unknown sample is placed in the cell and a reading taken. If the starch in question is the same as the starch used in preparing the standard curve, the quantity of starch may be read directly from the curve (see Fig 2). Standard curves are obtained by solubilizing known quantities of starch with perchloric acid and determining the transmission as outlined above. Curves prepared with one corn starch may be used with minimum error with other corn starches but may not be used for other types of starch *(1)*.

8. From the weight of starch in the sample and the weight of the original sample, the percentage of starch is easily calculated.

APPLICATION

ANALYSIS FOR STARCH GUM—1% and 5% solutions of starch gum (heat-converted starch) were heated to 200-212°F on a water bath with constant stirring and cooked for one hour. These pastes were padded onto starch-free strips of rayon cloth whose bone-dry weights were known (laboratory padder), and the strips were dried on a steamheated steel cylinder. The bone-dry weight was obtained, and the percent of starch gum padded on the sample was calculated. The samples were analyzed for starch gum with the results shown in Table II. There is less than 5% error in the experiments, which include two weighings besides the weighing required in the perchloric-acid method. There was also the possibility of losing some fibers from the samples during padding. It seems safe to conclude that there is considerably less than 5% error in the actual starch determinations.

INTERFERENCE OF LOCUST-BEAN GUM AND BEEF TALLOW——Pastes of starch gum, locust-bean gum and beef tallow were prepared as follows:

1. 1% Starch gum, 0.05% locust-bean gum and 0.05% beef tallow.

2. 5% Starch gum, 0.25% locust-bean gum and 0.25% beef tallow.

These pastes were padded onto rayon-

TABLE II

ACCURACY OF THE PERCHLORIC-ACID STARCH DETERMINATION AND INFLUENCE OF THE PRESENCE OF LOCUST-BEAN GUM, BEEF TALLOW AND UREA-FORMALDEHYDE RESIN

Sample Number	Solution, %			Padded on, %			Analyzed, %	
	Starch Gum	Locust-Bean Gum	Beef Tallow	Total Solids	Starch Gum plus LB Gum	Starch Gum	%	Error
1	1					1.27	1.29	+ 1.6
2	5					5.10	5.34	+ 4.7
3	5					5.33	5.22	— 2.1
Ave of 2 & 3	5					5.22	5.28	+ 1.1
4	1	0.05	0.05	1.29	1.23	1.17	1.38	+12.2*
5	1	0.05	0.05	1.35	1.28	1.21	1.28	0.0*
Ave of 4 & 5	1	0.05	0.05	1.32	1.26	1.20	1.33	+ 5.5*
6	5	0.25	0.25	6.05	5.75	5.45	5.86	+ 1.9*
7	5	0.25	0.25	6.20	5.90	5.60	6.00	+ 1.7*
8	5	0.25	0.25	5.34	5.07	4.80	4.69	— 7.5*
Ave of 6, 7 & 8	5	0.25	0.25	5.86	5.57	5.17	5.52	— 0.9*
9	5	Plus resin (approx 10%)				5.29	5.24	— 0.9
10	5	Plus resin (approx 10%)				5.18	4.99	— 3.6
11	5	Plus resin (approx 10%)				5.28	5.26	— 0.4
Ave of 9, 10 & 11	5	Plus resin (approx 10%)				5.25	5.16	— 1.7

* % error based on starch gum plus locust-bean gum.

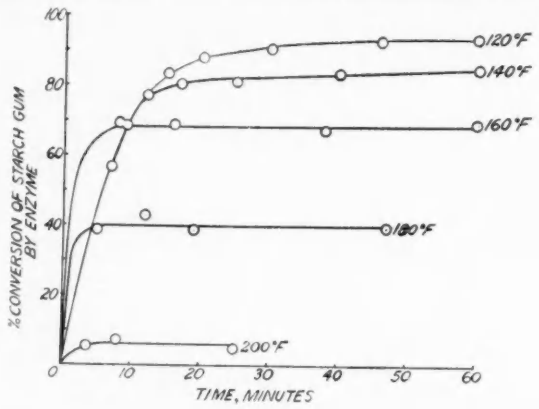


Figure 3
Speed and Percentage Conversion of Starch Gum by a Commercial Enzyme at Various Temperatures.

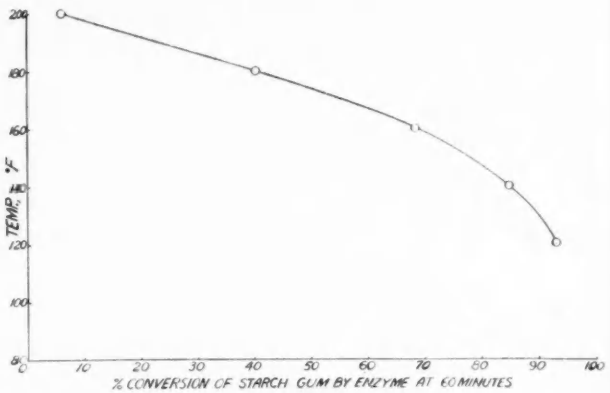


Figure 4
Effect of Temperature on Enzymatic Conversion of Starch Gum.

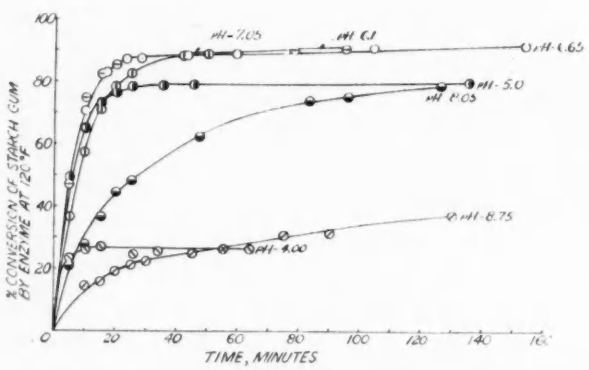


Figure 5
Speed and Percentage Conversion of Starch Gum by a Commercial Enzyme at Various pH Values.

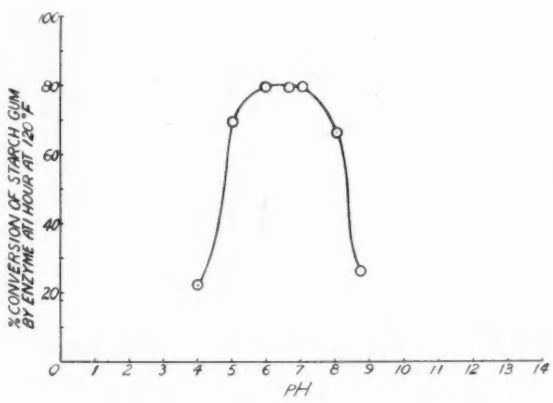


Figure 6
Effect of pH on the Enzymatic Conversion of Starch Gum.

fabric strips and the strips were analyzed by the perchloric-acid method with results as tabulated in Table II. The results indicate that the perchloric-acid method determines the locust-bean gum as well as the starch gum. Apparently the beef tallow does not interfere. One of the determinations (Sample 4) showed a large positive error, which could be due to fiber losses during padding. Another determination (Sample 8) showed a fairly large negative error, which could be due to accumulated weighing errors.

INTERFERENCE OF UREA-FORMALDEHYDE RESINS——A 5% paste of starch gum was prepared, padded onto a rayon-fabric strip and dried. Onto this sample was padded a commercial urea-formaldehyde resin plus catalyst. The sample was dried, cured and analyzed for starch by the perchloric-acid method with results as shown in Table II. This experiment was performed to determine the possibility of determining the residual size left in a fabric after the fabric is resin-finished. The results indicate that the resin padded on top of the starch does not interfere in the starch determination.

EFFECT OF TEMPERATURE ON ENZYMIC CONVERSION OF STARCH GUM——1% pastes of starch gum were prepared on a water bath at 212°F and maintained at various temperatures from 120 to 200°F. The starch content of each paste was determined by the perchloric-acid method beginning with step 6. To the paste at 120°F was added 0.5% of a commercial bacterial enzyme. Aliquot samples of this paste were removed at various times and analyzed for starch by the perchloric-acid method. The addition of acid in step 6 seemed to arrest the enzyme action. The pastes at the other temperatures were treated in the same manner. The data, as plotted in Figure 3, show the progress of the enzyme action at the various temperatures. At the higher temperatures, the enzyme action is fast but the percentage conversion of starch gum is low. At the lower temperatures, the enzyme action is slower but the percentage conversion of starch gum is high. Figure 4 shows more clearly the effect of the temperatures on the conversion of starch gum. The optimum temperature for practical desizing with this particular enzyme appears to be from 120-130°F. Of course, the desizing bath would probably have to be somewhat higher in order that the cloth after padding be within this temperature range. As the temperature is lowered below 120°F, the gain in conversion would not offset the loss in speed. As the temperature is increased above 130°F, the gain in speed would not offset the loss in conversion.

EFFECT OF pH ON ENZYMIC CONVERSION OF STARCH GUM——1% pastes of starch gum were prepared on a water bath at 200°-212°F and maintained at 120°F. These pastes were buffered at various pH values from 4.00 to 8.75 with

(Concluded on Page P866)

Intersectional Contest——

THE EFFECT OF AGITATION ON DYEING* (PART I—WOOL AND ACID DYES)

NORTHERN NEW ENGLAND SECTION

INTRODUCTION

IT has long been known that agitation in any form is advantageous to the dyeing process. Various workers, including Lemin, Vickers, and Vickerstaff (*1*), have found that variations in agitation during dyeing result in a variation in the amount of direct cotton dye absorbed by cotton. Hanson, Neale, and Stringfellow (*2*) have also found this to be true on rayon as well as on cotton.

Speakman and Smith (*3*), in dyeing mohair and human hair with Acid Orange 2G, found a linear relationship between the dye absorbed by the fiber and the square root of the time over long dyeing periods in spite of the fact that the dyebath concentration decreased considerably in the meantime. This indicates the existence of a layer saturated with dye at the fiber surface, from which diffusion into the fiber takes place. In order that diffusion of dye into fiber and exhaustion of dye from dyebath may be enhanced, it is necessary to decrease or replace this film or layer once the dye concentration in this layer has been lowered, otherwise further diffusion and exhaustion will be retarded. This is the major role which agitation plays in the dyeing process. The previous work with agitation has been performed primarily with direct cotton dyes on cellulosic material. The purpose of this work is to investigate and define the effect of agitation on wool.

EXPERIMENTAL

The apparatus used for dyeing in this work required a constant, measurable source of agitation and a constant temperature bath. In order to insure not only a constant, but also a uniform agitation, a mechanical wrist-action shaker was used. This shaker was a Burrell Wrist-Action Shaker, Model CC operated by a 115-volt, 60-cycle motor. The shaker vibrated at a constant rate of 360 cycles per minute. The variations in agitation were obtained by a clutch setting on the shaker, which changed the amplitude, or arc, through which the shaker vibrated. The clutch settings used are indicated by the amounts called "Agitation 5" and "Agitation 10." These values have no significance other than that Agitation 10 had an amplitude double that of Agitation 5. In other words, a dyeing made at setting 10 was moved through twice the distance that a dyeing made at setting 5 was moved, but at the same number of cycles per minute.

Several 300-ml Kjeldahl flasks with cork stoppers were clamped to the wrist-action shaker in such a manner that the distance from the surface of the dyebath in the flask to the shaker arm was the same in all cases so as to insure that each dyeing would move through the proper arc. The flasks attached to the shaker arm were then submerged into a water bath at 60 ± 1°C.

The dyeings were made on a wool serge fabric which had been previously scoured with a nonionic detergent and thoroughly rinsed. One-gram samples were dyed at a 50/1 bath ratio. The following dye formula was used for all dyeings:

1.0% Erio Floxine 2G (C I 31)
2.0% Sulfuric acid (96%)
15.0% Sodium sulfate

Individual samples were dyed for lengths of time varying from 1 minute to 120 minutes. All except one set of dyeings were found to reach equilibrium exhaustion in appreciably less than 120 minutes. After being dyed, the samples were cold-water-rinsed and air-dried. Reflectance values for all dyed fabrics were determined by measurement with a General Electric Recording Spectrophotometer.

After each dyeing was completed, the dyebath was cooled to room temperature and its light transmission was measured with a Cenco Photelometer. Each series of dyeings was done in triplicate, and the average exhaustion value was determined at each time interval.

Dyeings were made at a clutch setting of Agitation 5 and Agitation 10 as previously explained. Dyeings were also made in which a weight of glass beads equivalent to the weight of the dye solution plus the fabric was added to each dyebath, in adddition to the fabric and the dye solution. This series is designated as 5G and affords a doubling of the total energy input of the dyeing process thru the use of an inert material. A series designated as 5D was made in which the total energy input was doubled by

F B Shippee

COMMITTEE

John H Skinkle,
Chairman and Speaker
Elmer Fickett
E R Kaswell
Frank J O'Neil
Fred B Shippee

TABLE I

EXHAUSTION, PERCENT OF ORIGINAL

t minutes	E_{5}	E_{5}	E_{10}	E_{5G}	E_{5D}
1	8.5	29.5	36.5	30.0	31.5
2	9.0	41.0	49.0	42.5	44.5
4	12.5	55.0	60.0	57.5	63.0
6	17.5	63.0	69.5	64.5	74.0
8	21.5	69.0	73.5	70.0	76.5
10	23.0	71.5	75.5	75.5	82.0
12.5	23.0	76.0	80.0	79.5	83.5
15	24.5	78.5	83.0	81.0	85.5
17.5	30.5	82.0	85.5	84.0	87.5
20	26.5	83.5	87.0	85.0	88.0
25	32.5	87.5	88.0	88.0	90.5
30	34.0	89.0	90.0	89.0	92.5
40	46.0	89.5	91.5	91.0	93.5
50	54.0	93.0	93.0	91.5	93.0
60	51.5	92.5	93.0	92.5	94.0
75	62.0	93.0	94.0	93.0	95.5
90	67.0	93.5	94.0	93.0	95.5
120	71.5	94.0	94.0	92.0	95.5
180	83.0				
300	87.0				
420	91.0				

* Presented by Fred B Shippee at the 30th Annual Convention in New York on October 19th, 1951; prepared for the Section by John H Skinkle, associate professor at Lowell Textile Institute, and F B Shippee, a graduate student.

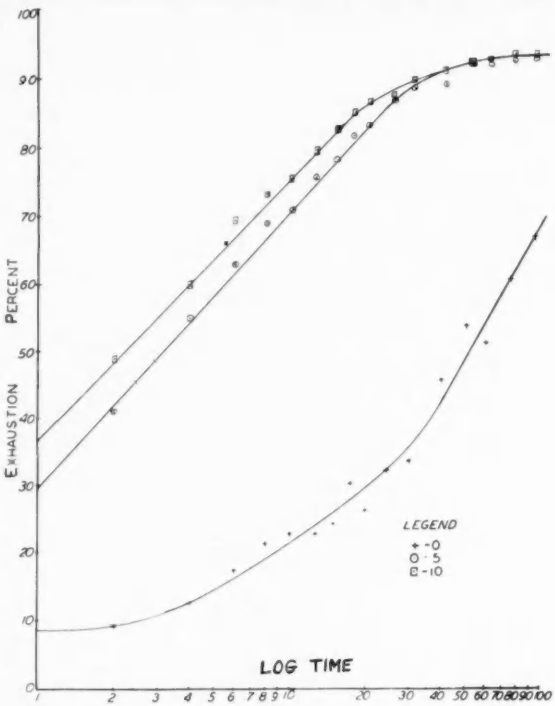


Figure 1

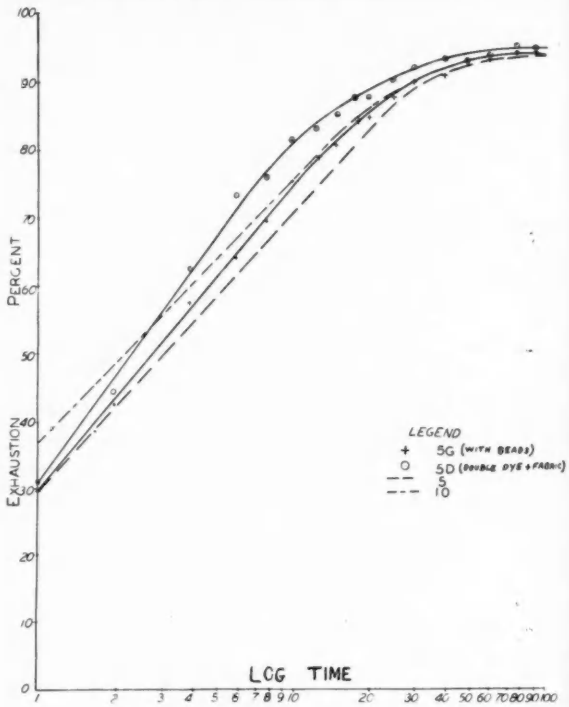


Figure 2

Exhaustion vs Log Time

using twice the amount of dye solution and twice as much fabric. Thus dyeings may be carried out not only with double the energy by doubling the amplitude of the shaker but but also with double the energy by doubling the mass in the dyebath.

DISCUSSION OF RESULTS

The dyebath exhaustions, shown in Table I, give the exhaustion values obtained with the various types of agitation at indicated times of dyeing. For ease of comparison these values have been plotted in Figure 1. This plot is made of percent exhaustion vs log time in minutes. The purpose of using log time was to amplify the curve in the initial stages of dyeing, as this appears to be the area where the greatest variation results through the use of different types of agitation. These curves show that agitation in any form or amount caused a marked increase in the rate of dyeing. The rate of dyeing is indicated by the slope of the exhaustion-vs-time curve. It is obvious that, given sufficient time, Agitation 0 would also reach the 93% exhaustion attained by the other series. However, after seven hours, Agitation 0 was only 90% exhausted and had not yet reached equilibrium. Since times as long as, or in excess of, seven hours are not practical from a commerical viewpoint, no further investigation of this method was made. It is of interest, however, to note that, even in the absence of agitation, the equilibrium exhaustion seems to approach that of dyeings made with agitation, but at a much slower rate. If sufficient time could be allowed, it is possible that more level dyeings could be obtained because of this slower rate. Agitations 5 and 10 result in lines which are approximately parallel in the initial stages and thus exhibit approximately equivalent rates of dyeing. Their equilibrium exhaustion is approximately the same, 93.0% for 5 and 93.5% for 10. The principle difference in these two degrees of agitation is the amount of dye deposited instantaneously or in the first minute of dyeing. This value, often referred to as strike, is much greater with the larger amount of agitation. In the case of unlevel dyes this excessive agitation might be a distinct disadvantage.

Figure 2 shows the effect of doubling the total energy in the dyebath. The use of inert material, in this case glass beads, has the least effect, but even this causes an increase in the dyeing rate. The effect of doubling the dye solution and the weight of fabric is to increase the dyeing rate considerably. It is interesting to note that, in all cases, increasing the energy in the dyebath has no effect upon the amount of dye deposited per unit weight of fabric in the initial dyeing period; also, doubling the energy does not appreciably change the equilibrium exhaustion values, although a slight increase is shown. This work on wool has shown that neither amount nor type of agitation appreciably affects the equilibrium exhaustion value. This is contrary to the results obtained by other workers on cotton and rayon.

Table II shows a comparison of the various amounts of agitation with respect to equilibrium exhaustion, time of half dyeing, and time of ring disappearance. The time of half dyeing is most greatly affected by doubling the amplitude of the wrist-action shaker. Since the rate of dyeing and equilibrium exhaustion of Agitation 5 and 10 are approximately equal, this reduction in time of half dyeing is obviously due to the increase in strike, or amount of dye instantaneously deposited by setting 10. The change in the half-dyeing time from doubling the mass component of the energy has been found to be small but measurable.

The term "ring disappearance" means the time after which dyeing no longer takes place in a ring fashion, or the time after which the concentration of dye at the center

(Concluded on Page P866)

TABLE II

Agitation Shaker Setting	E_{∞} Percent	$t_{1/2}$ Minutes	Ring Disappearance Minutes
5	93.5	2.6	12.5
5G	93.0	2.4	15.0
5D	95.0	2.2	12.5
10	93.5	1.7	20.0

GENERAL RESEARCH COMMITTEE MEETING

NOVEMBER 16, 1951

THE 169th meeting of the General Research Committee was held at the Hotel New Yorker, New York, N Y, Friday, November 16, 1951.

The meeting was opened by Chairman L S Little at 2:07 pm. A discussion indicated that future meetings will probably start at 1:30 pm, but inasmuch as the Council meeting is scheduled to start somewhat later than heretofore, there is a possibility that the Research Committee meeting may be a little late. Mr Little reviewed matters considered by the Executive Committee on Research at their meeting the previous evening. He stated that the various committees and personnel at Lowell had cooperated well in lining up data to be submitted to the International Standards Organization. December 15 has been set up as the deadline for sending the information to Europe. He also reported that dyed cloth for the various testing committees is now in process and will shortly be available. It was pointed out that some of this will be sent abroad for standardization of tests. A new committee has been set up on bleaching of cellulose fibers under the chairmanship of T E Bell of the Electrochemicals Department of du Pont. A hope was expressed, that at the next ECR meeting a conclusion may be arrived at on a program to utilize the $2,000 appropriated by the Philadelphia Section from the proceeds of their last convention. Representatives from Philadelphia will be invited to the meeting in order that the subject chosen will be suited to the facilities available at the Philadelphia Textile Institute. Mr Little stated that the next meeting of the General Research Committee will be held January 18 in New York. Following this announcement, he turned the meeting over to Dr Stiegler, Director of Research.

Dr Stiegler presented highlights of the work being done at Lowell, covering the following items:

(a) Cooperation on attempts to reconcile approximately fourteen fastness tests with consideration of both the British and AATCC methods for transmission to ISO. Each test in the new *Year Book* will be started with a "principle of the test" explaining in a sentence or two just what the test method is.

(b) The Quartermaster has released the report prepared by Lowell some time ago on the method for getting the greatest fastness for the O D #7 shade on cotton. The release, which includes work done on the same subject by the Quartermaster, will be published as a bulletin of the Department of Commerce. This combined report is being returned to the committee that originally handled this AATCC project who will edit it for final report in our publication.

(c) Preparation of the 1952 *Year Book* is proceeding with special emphasis being placed upon revising the format in reporting methods.

Dr Stiegler recently attended a meeting of the American Home Laundry Manufacturers Association and found them considering many matters of interest to us. He stated that they were much interested in our program.

The Lowell staff is doing work for the following committees: Washing, Dimensional Changes, Abrasion, and Dry Cleaning. They recently put considerable work on the exhibits for the Annual Meeting. Lowell is considering recommendation of our present gas fading equipment as being suitable also for stoving or even as a conditioning chamber. In connection with the Accelerotor, dry abrasion tests are now being made. The AATCC files at Lowell are also being reviewed.

Dr Stiegler introduced Dr T G Hawley, Jr, Chairman of the Subcommittee for Simplified Control Tests who stated that his committee can not as yet report on a combined shrinkage test. With reference to the spot tests recently developed, he reported that interlaboratory work is still progressing.

B A Ryberg reported for the Subcommittee on the Preparation of Standard Soil Material. His committee has elected a new chairman, George Wiseman. This committee has run continuing tests comparing two standard soil materials from the U S Testing Company and Better Fabrics Testing Bureau. They found the results quite comparable on both fabrics and formal report is in preparation. This will prompt other laboratories to run comparative tests and report their experience, it was stated.

M G Babey, chairman for the Subcommittee on Fastness to Light, reported that prior to the meeting a draft of our standard method had been prepared and suggested for transmission to ISO. At their meeting the day before the committee had been rather critical of this draft, some of them finding parts of the method questionable. Mr Babey made it clear that the AATCC blue standards are still the basis of our light tests. The L-4 example which was given in the draft is merely an example of what the committee means by "appreciable change". In order to clarify the matter, more explanatory material has been added and the draft will be resubmitted for approval and ultimate transmission to ISO. It was requested that returns from the committee be in by December 5 in order to allow time for transmission of the final draft.

In connection with anomalous tests on synthetic fabrics as between sunlight and Fade-Ometer, the committee has received a large number of examples previously requested and has turned them over to Mr Siebert. The latter will start tests shortly in Florida, it was reported, with interlaboratory Fade-Ometer tests going on at the same time.

Mr Little commented on the fact that Mr Siebert had recently submitted a report of his activities of the past two years and stated that a summary will be prepared and circulated in an attractive binder or folder, and that this binder or folder will be so selected to be appropriate for circulation of other interesting reports in the future.

In response to a question by Mr Klein on the Bureau of Standards 1554 Papers, Mr Appel said that the supply of the paper currently being furnished will shortly run out. He stated that a new batch has been prepared to assure continuity and his organization is still experimenting to get something better for the calibration of the Fade-Ometer.

Dr G R Ferguson reported for the Subcommittee on Insect Pests. This committee is cooperating with similar committees of ASTM and the Chemical Specialties Manufacturers Association, seeking a better quantitative expression of results and better duplicability of tests in various laboratories. Much work has been done over the past four years seeking simplification and standardization of biological methods. The work of the past two years is said to have improved accuracy approximately ten percent over the results of the previous two years. Many reports have

(Concluded on Page P866)

Contribution——

INFRARED RADIANT DRYING OF TEXTILES*

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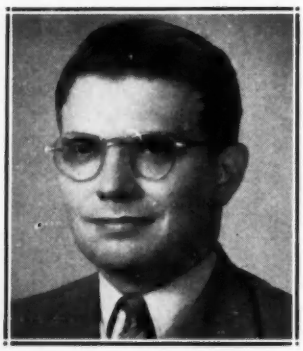


F M Tiller

This investigation was concerned with the radiant drying of textiles in ovens equipped with infrared lamps. Experimental runs were made both with small sections of cloth in stationary tests and with continuous passage of cloth in 18-inch widths between two banks of lights. The small-scale tests were utilized primarily to study the absorption of radiation as affected by the properties of the cloth, such as color, moisture content, and weight per square yard. The continuous tests were made in an oven which could be equipped with either eighty 250-watt (total of 20 KW), or eighty 375-watt (total of 30 KW) lamps. The characteristics of the oven and drying rates for several different cloths were determined. Rates of drying in the neighborhood of 7 lb/(hr)(sq ft) were obtained.

W K Lautner

INTRODUCTION

INFRARED lamps are being widely employed as a means for converting electrical energy into heat in industrial processing. These lamps possess larger and more rugged filaments than the bulbs used for normal lighting practice, and, in addition, are constructed to withstand ambient temperatures that would cause failure in the incandescent globe or its structural components. As the filament of the "infrared" lamp operates at a somewhat lower temperature than the filament of the "incandescent" lamp, a slightly larger percentage of the radiation is in the infrared region. Actually, the differences in radiation characteristics between the two lamps are of little practical importance. The incandescent lamps themselves produce around 85-95 percent of their radiation in the infrared region, and the more expensive infrared lamp is chosen for heating purposes solely because of its longer life. Resistance heaters may also be used for producing heat from electrical sources. However, in the past to prevent rapid oxidation and deterioration, the elements have been operated at relatively low temperatures; and consequently the percentage of radiation produced was smaller than with lamps. Since the radiation is desired for producing high rates of heat transmission, the lamps have been superior to the resistance heaters in this respect. However, with the advent of newer alloys, it has been reported by Goodell *(3)* that open resistance units which approach lamps in percentage radiation produced are now in commercial production.

RADIANT HEATING VS CONVECTION

In comparing radiant and convectional heating, it should be kept in mind that properly designed lamp installations are fully insulated, and air temperatures are frequently in the range of 200-400°F. Thus the lamp oven is actually a combined radiation and convection unit, and, in making comparisons, this should be carefully considered. A study of lamp characteristics and intensities is necessary to a study of the commercial use of radiation.

Lamps with self-contained reflectors in 250- and 375-watt sizes and having a bowl diameter of 5 inches are both efficient and easily maintained. Clear bulbs up to 500 and 1000 watts in addition to the lower wattages are also employed with auxiliary reflecting surfaces. However, the reflectors become dirty under ordinary atmospheric conditions and lose in efficiency. The auxiliary reflectors generally have diameters of 9-12 inches and cannot be placed on as close centers as the reflector lamps. Thus, even with the larger-wattage bulbs the radiant intensities may not be as high as with the self-contained reflector lamps. The intensities produced by the self-contained reflector lamps depend upon the arrangement and distances from center to center. Under usual conditions, average intensities will be in the neighborhood of 3500-4500 Btu/(hr)(sq ft) [or 7-9 watts/sq in] for 375-watt lamps and 2500-3000 Btu/(hr)(sq ft) [or 5-6 watts/ sq in] for 250-watt lamps where watts/sq in are multiplied by 491.6 to obtain Btu/(hr)(sq ft). In those cases where lamps may be used on both sides of materials, such as textiles, the effective intensities will be twice the values just given.

For the newly introduced open calrod resistors with special high temperature alloys, Goodell *(3)* reports that units with as high as 3500 watts/sq ft (24.3 watts/sq in) input are now being built for commercial use. As yet no data are available for the amount of this energy appearing in radiant form. However, comparisons can be made with closely grouped 375-watt lamps where the input radiation is about 2000 watts/sq ft (13.9 watts/sq in). Approximately 60-70 percent of the lamp energy input appears in useful radiant form leading to actual intensities of from 8.5-9.5 watts/sq in for closely clustered lamps. It would not be unexpected that these new open resistance units might give higher intensities than those obtained with lamps. Calrod units possess the distinct advantage of having fewer and more simple electrical connec-

* Received by the Editor of Proceedings on May 16, 1951.

tions.

A comparison of heat-transfer rates in different oven arrangements is vital to a proper understanding of radiation ovens. Useful information can be obtained from considering natural-convection and forced-convection hot-air ovens as compared with radiant-heat ovens combined with forced or natural convection. The heating of a filing cabinet in which one side of a metal panel or surface is exposed to both radiation and convection represents a typical example that will serve for illustrative purposes. Both in convection and radiation ovens, the heat-transfer rate is initially at a maximum and decreases until the steady state is reached when the net rate is zero. Initially the rate of heat transmission is determined by the sum of the absorbed radiation and convectional effects, thus

$$\text{initial rate} = AI + h(T_a - T_o) \quad [1]$$

where I is the radiant intensity in Btu/(hr)(sq ft) and A is the overall absorptivity. If the air temperature, T_a, is above the initial stock temperature, T_o, convectional heat will be transferred into the material at a rate per square foot equal to the product of $(T_a - T_o)$ and the film coefficient of heat transfer, h. By placing the radiant intensity, I, in [1] equal to zero, the remaining term, $h(T_a - T_o)$, gives the initial rate of heat transfer for a convectional oven.

For purposes of making rough comparisons between radiation and convection, coefficients of 3.0 and 7.5 Btu/(hr)(sq ft)(°F) will be used in the following discussion of natural and forced convectional heating. To obtain a rate of heat transmission of 4500 Btu/(hr)(sq ft) corresponding to the use of 375-watt reflector lamps, temperature differences of about 1500°F (actually less because of increased value of h with larger temperature difference) and 600°F would be required for natural and forced convection heating, respectively, with the coefficients just given. Thus it is apparent that high air temperatures would be required to give heat-transfer rates in convection ovens comparable to those obtainable with infrared lamps.

Actually, comparisons between radiant intensities alone and convectional rates of heat transfer may be misleading, since, according to Eq [1], the radiation is accompanied by convection, and the combined effects must be considered. In Table I is shown a comparison of the approximate heat-transfer rates based on Eq [1] for several combinations of heating, a stock temperature of 80°F and an absorptivity of unity being assumed.

The advantages of radiation in combination with forced convection are apparent from an examination of Table I. The values listed in Table I represent the initial net rate of heat transfer, which will diminish as the temperature of the stock rises. Obviously the rates in Table I would change for other coefficients of heat transfer and absorptivities. Where the absorptivity falls below unity, the radiation effects are lessened.

TABLE I
INTENSITY OF HEAT TRANSMISSION, Btu/(hr)(sq ft)

Air Temp deg F	*Natural Convection*	*Forced Convection*	*Radiation plus Natural Convection*		*Radiation plus Forced Convection*	
	h = 3	*h = 7.5*	*250-W*	*375-W*	*250-W*	*375-W*
200	360	900	3360	4860	3900	5400
400	960	2400	3960	5460	5400	6900
600	1560	3900	4560	6060	6900	8400

Intensity for 250- and 375-watt lamps assumed to be 3000 and 4500 Btu/(hr)(sq ft).

In addition to the total initial rate of heat transfer, the relative proportions of radiation and convection were indicated in Table I for metal heating. It is of interest to make similar calculations for the drying of textiles, such as the thin cotton materials used in this investigation. Conditions for determining the net rate of heat transfer to a wet surface differ somewhat from those employed for the metal panels just discussed. The mass transfer of moisture from the cloth takes place in the opposite direction to the heat transfer, and both transfers must be considered simultaneously in calculating the convectional effects *(6)*. The rate of mass transfer per square foot of cloth is given by

$$R = 2k(p - p_a) \quad [2]$$

where R is the rate of drying in lbs/(sq ft)(hr), k is the mass-transfer coefficient, p_a the partial vapor pressure of water vapor in the air, and p the vapor pressure at the temperature of the cloth. The factor two is included since there is evaporation from two sides of the cloth. The rate of heat transfer is given by

$$\text{rate} = AI + 2h(T_A - T) \quad [3]$$

where T is the cloth temperature and T_A the air temperature. The rate of drying in [2] multiplied by the enthalpy change per pound of water on evaporation equals the rate of heat transfer as given in [3]. Thus

$$AI + 2h(T_A - T) = 2k(p - p_a)[1_v + 0.46(T_A - T)] \quad [4]$$

where 1_v is the latent heat of water at temperature T and 0.46 is the specific heat of water vapor. In order to use Eq[4], all the variables except p and T must be known. Since p is the vapor pressure corresponding to T, a vapor pressure relation combined with [4] yields two simultaneous equations from which the solution for the cloth temperature may be obtained by trial and error. Estimation of the cloth temperature during the constant-rate-of-drying period led to values in the range of 130-150°F for variations in dew point of 100-130°F and air temperature of 100-300°F with an absorbed radiant intensity (AI) of 6550 Btu/(hr)(sq ft) [corresponding to a blue gabardine cloth radiated with 375-watt lamps on two sides]. The coefficient of heat transfer used in the above calculations was taken to be 12.0 Btu/(hr)(sq ft)(°F) as estimated from tests on metal panels.

A simple example involving the radiation of a cloth under the following conditions will illustrate the relative effects of radiation and convection:

Cloth: blue gabardine
Radiation: two-sided radiation with 375-watt lamps giving an absorbed intensity of AI = 6550 Btu/(hr)(sq ft)
Air temperature: 200°F
Cloth temperature during constant rate of drying: 140°F
Coefficient of heat transfer: 12.0Btu/(hr)(sq ft)(°F)

Based upon Eq[3] the convection is computed as (2)(12)(200-140) = 1440 Btu/(hr)(sq ft). Added to the radiation, the total rate of heat transfer becomes 1440 + 6550 = 7990 Btu/(hr)(sq ft), which would give a rate of drying in excess of 7 lb/(hr)(sq ft). In this example 17% of the total heat transfer was due to convection. Increase in the air temperature would result in a larger convectional effect.

The time required to reach the constant-rate-of-drying period for the example just cited can be approximated by assuming that no evaporation takes place until a temperature of 140°F is reached. The cloth in question had an initial moisture content of 0.7 lb water/lb of cloth, a density of 0.466 lb of dry cloth per square yard (0.0518 lb/sq ft), and a heat capacity of about 0.054 Btu/(sq ft)(deg F) based upon a specific heat of 0.33 Btu/(lb)(deg F) for cotton. This heat capacity for the cloth compares with a value of 0.14 Btu/(sq ft)(deg F) for a 20-gage steel panel with a thickness of 0.03 inches. To be heated from 70 to 140°F at 7990 Btu/(hr)(sq ft) would require 3.71 Btu/sq ft and a time of about 1.7 seconds.

LIMITATIONS——Infrared ovens in industry are limited to those processes in which all surfaces being heated can be "seen" by the radiation. While flat surfaces are ideal, the radiation pattern can be designed to heat surfaces that are at an angle to the plane of the lamps. This is generally accomplished at some sacrifice in intensity. It may be argued that in the heating of three-dimensional objects, the radiation will strike some surfaces with less intensity than others and uneven heating will develop; while presumably, in hot-air heating, this difficulty would not be encountered. However, in a forced convection oven, the coefficient of heat transfer may be quite different from surface to surface, and the same condition of uneven heating results. It is true that in a hot-air oven, the objects can be stacked in manners which are impossible in radiant ovens, and materials with a very low absorptivities or high reflection factors can be better handled in some instances.

MISCONCEPTIONS——The field of radiant heating has become associated with a number of erroneous ideas. In the early days of baking enamels on metal surfaces, the success of radiant heating was frequently attributed to a mechanism in which the baking occurred from the "inside out". Tiller and Garber *(6)* indicated that, depending on the translucence and thickness of the film along with the reflection characteristics of the metal, heating and baking could occur from inside out, outside in, or uniformly throughout the film. For thin films the points at which the radiation is converted to heat is probably of little importance in the majority of industrial finishing operations. However, penetration in textiles and other porous or thin materials may be of importance. It will be shown later that an appreciable portion of the radiation may be transmitted through a single thickness of cloth. Paul and Wilhelm *(4)* have investigated the penetration of radiation in the drying of thick wool blankets. They indicated that a considerable portion of the radiation was absorbed in the interior of the materials being dried. Data taken in the Vanderbilt Chemical engineering Laboratories indicate that penetration is insignificant in the radiation of wood.

Many authors in the past have indicated that astounding savings in times could be obtained with the substitution of infrared for convection. It was not uncommon to hear of reductions in baking schedules from a matter of hours in hot air ovens to minutes or even seconds in radiation ovens. However, it was seldom mentioned that the change in method of heating was usually accompanied by the substitution of a fast-baking synthetic enamel for a slower-baking oxidizing finish. Thus most of the comparisons of the two modes of heating had no meaning since two variables were changed simultaneously. Ernst and Schrumacher *(1)* showed experimentally that if identical rates of heat transfer were maintained in either convectional or radiant baking of enamels, there were no significant differences in the cured films. Actually, the introduction of rapidly setting polymerizing enamels was primarily responsible for setting the stage for great time savings in industrial finishing. Prior to the introduction of coatings with quick-curing synthetic resins, high rates of heat transfer were not necessary since the oleoresinous-varnish-base enamels had to bake for relatively long periods of time at moderate temperatures. With the new finishes, infrared radiant heating has been ideally suited because of the desirability of high rates of heat transfer. Examination of Table I shows that with 375-watt lamps, intensities in the range of 4860 to 6400 Btu/(hr)(sq ft) can be expected. The import of these rates of heat transmission can be best comprehended by considering the time required to carry out a typical baking process. Suppose a surface forming the side of an enclosed box enameled a dark green on 20-gage steel initially at 80°F is to be heated to 300°F. If 375-watt lamps were employed in a forced convection oven at 400°F and with $h = 7.5$, the time required would be about 24 seconds. For comparison, if the lamps were omited in the above example, the time required would be 82 seconds or nearly 3.5 times as long. In order to reach 300°F in 24 seconds with hot air alone, a temperature of 850°F would be required in a forced convection oven with a coefficient of 7.5. These examples show what advantages may be expected with infrared ovens.

Some sources have suggested that since the radiation passed directly to the stock without being absorbed or diminished in intensity, insulation and oven walls were unnecessary. An examination of Table I will show the absurdity of this postulate. In uninsulated ovens, the ambient temperature is not often much greater than the initial stock temperature, and the initial portion of the rate of heat transfer due to convection is negligible. However as the stock temperature rises, heat is lost to the surrounding atmosphere at an increasing rate, thus diminishing the effectiveness of the radiation. With an unenclosed oven, the initial net rate of heat transfer with 375-watt lamps would be about 4500 Btu/(hr)(sq ft) when heat transfer from the air is assumed to be negligible. From Table I it can be seen that if the temperature were increased to 400°F, an entirely feasible event resulting from conservation of lost heat by enclosing the lamps, the rate of heat transmission would be increased about 20 percent to 5460 Btu/(hr)(sq ft). With the addition of forced convection, the increase would be even greater.

INTENSITY OF RADIATION——Light meters and other instruments have long been employed for determining intensities in ranges mostly under one watt/sq in. Paul and Wilhelm *(4)* indicated that instruments employed for measuring intensities of normal illumination are unsatisfactory for commercial infrared lamps when the calibration curves are extrapolated, and they pointed out the need for accurate instruments. Dependable though not precise methods for obtaining intensities were developed in this investigation. In order to obtain variable intensities, the voltage across a bank of 12 lamps was varied, and measurements to be described were made. A vacuum thermocouple was then calibrated under the lamps at different voltages and used for making intensity measurements in other ovens.

In the infrared region water has a high linear absorption coefficient and an average reflectance of a little under 2%. Thus the greater part of the radiation from a bank of lights striking a surface will be absorbed and converted to heat. By blackening the interior of the vessel in which the water is held, to assure absorption of transmitted radiation, the percentage of radiation striking the surface and transformed to heat will approximate 97-98%. If water in a pan is placed under a radiant beam, the water temperature will rise to some constant value and the evaporative rate will reach a maximum. If in addition the air temperature is adjusted to the same temperature as the water, no convectional heat transfer will be effected between the water and surrounding atmosphere, and the only source of heat will be the radiation from the lamps. By carrying out this procedure, the intensity may be calculated from the rate of evaporation multiplied by 1.02 to take care of the reflection. The method suffers in that intensities from a bank of lamps will vary as much as 10% over the area of a pan having a diameter of 4-5 inches and the pan itself will absorb some radiation. These difficulties coupled with the approximation introduced by the multiplier to take care of reflection probably prevent the final intensities from being determined with an accuracy of greater than ±5%.

A summary of the results obtained in an oven operated as described above and containing twelve 250-watt lamps on 60° centers is given in Table II. A 4.25-inch-diameter pan, shielded from the radiation with aluminum foil, blackened on the inside and filled with water, was placed on a scale with a 0.1-gram sensitivity. The water was heated near to the equilibrium temperature before beginning the run. The mass was determined as a function of the time, and the steady rate of evaporation calculated. The temperature of the oven was manually adjusted by manipulation with a Bunsen burner.

At each voltage the vacuum thermocouple was calibrated with an arbitrary scale. The intensities in Table II are probably within 3-5% of the true average values. However, the variation in intensity over the surface of the water caused fur-

TABLE II

Voltage	Temperature of water, °F	Rate of evap lb/(hr)(sq ft)	Intensity Btu/(hr)(sq ft)
43.5	128	0.371	710
44	130	0.395	718
70	153	0.955	1458
77.5	172	1.428	1676
100	185	2.151	2472
119	192	2.836	3253

ther uncertainty in reading the intensities on the vacuum-thermocouple scale. The final values employed were probably accurate within ±10%.

TEXTILE DRYING

Infrared-radiation ovens are ideally suited for the drying of wet textile materials. The cloth presents a solid bank, which intercepts nearly all of the radiation incident to the surface in contrast to many baking operations in which a large proportion of the energy is lost without ever striking the surfaces to be heated. With thin materials, an appreciable proportion of the radiant energy may be transmitted and unabsorbed by a single layer of cloth. However, the loss of energy in this manner may be largely circumvented by employing multiple passes of cloth in the oven, thereby causing the unabsorbed and transmitted radiation to be diminished with each thickness of material. Vertical ovens having lamp banks on each side of the cloth can be utilized with resultant high rates of heat transfer and saving in floor space. Horizontal ovens should in general be avoided where two lamp banks are to be employed since one bank will be under the cloth and subject to dripping water, falling particles, etc. Breakage due to temperature strains and melting of the glass under high intensities can be avoided by the use of hard glass lamps in the 375-watt-reflector size. In combination with forced circulation perpendicular to the cloth, compact installations should result. The radiation is ideally suited for the wet end, while, on the other hand, hot air may be readily employed in forced circulation at the dry end. The hot air section may be used to recuperate part of the direct heat losses from the lamp thereby increasing the overall efficiency. The possibility of preheating incoming air with conventional heat exchangers should not be overlooked in the design of a commercial oven.

In designing an industrial oven, the chief information needed is the time or cloth speed required to reduce the initial moisture content to the desired final value. In order to obtain data of this type, two different 80-lamp Trumbull Electric Manufacturing Company ovens were employed in the drying of various types of textile materials. One oven

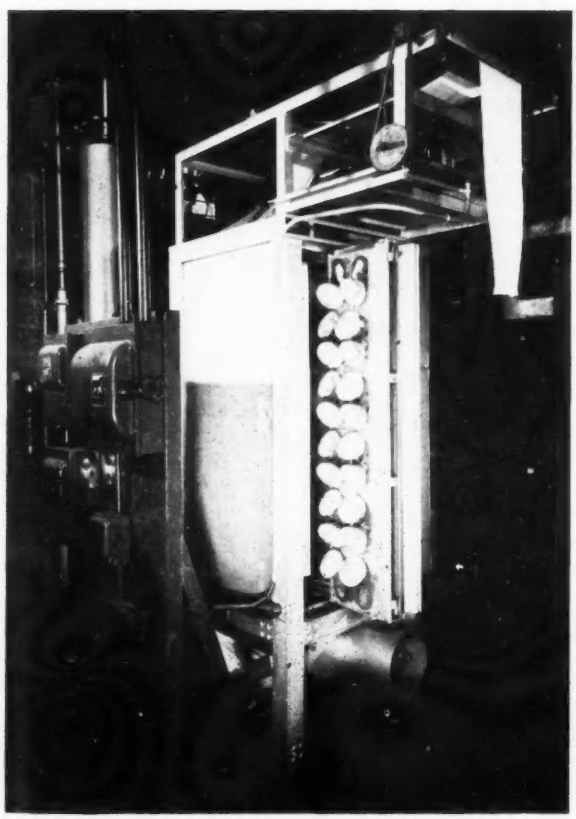
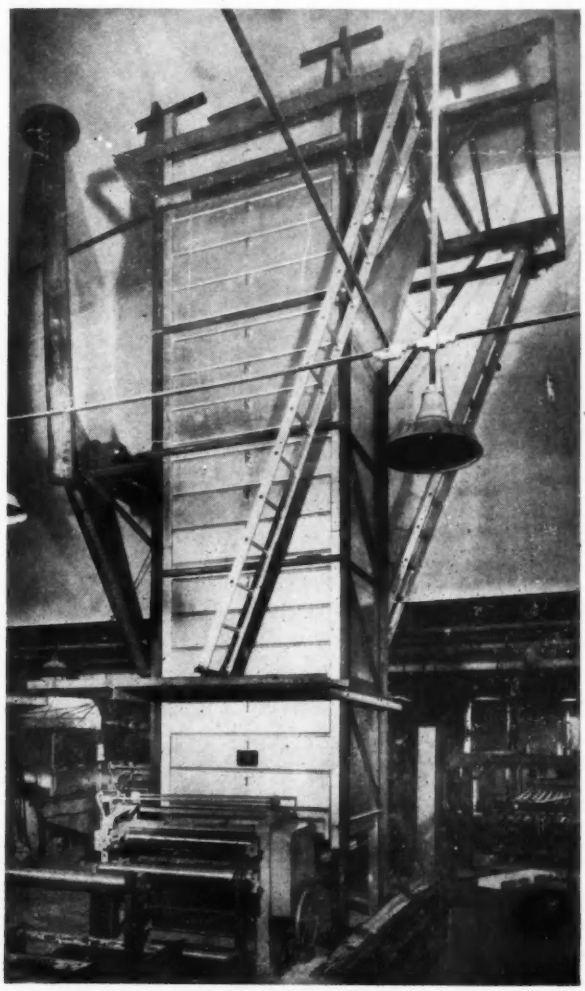


Figure 1
80-Lamp Experimental Oven For Continuous Textile Dyeing



(Courtesy Jensen Specialties, Inc, Detroit, Mich)

Figure 2
A Vertical Industrial Oven Similar To The Experimental Model

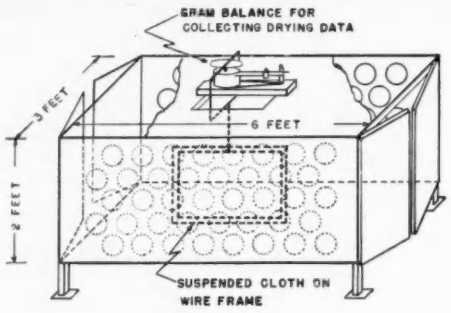


Figure 3
Schematic Diagram of 80-Lamp Experimental Oven Used for Stationary Tests

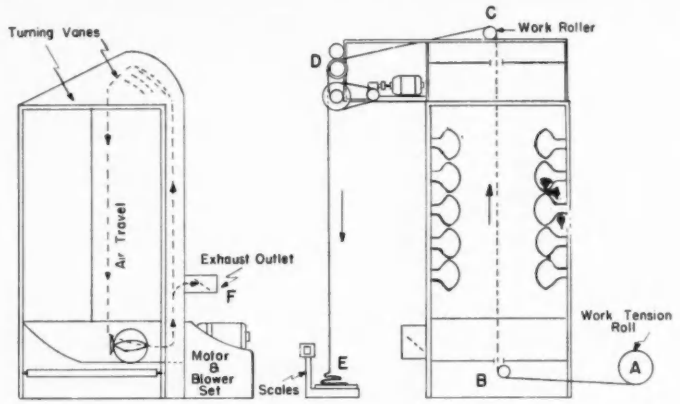


Figure 4
Schematic Diagram of Continuous Experimental Oven

was utilized for making small stationary tests while the other unit (Fig 1) was equipped for the continuous passage of cloth through the oven along with forced air recirculation. An industrial oven is shown in Fig 2.

EXPERIMENTAL PROCEDURE

In carrying out tests in the stationary oven, the cloth was placed on a frame, which was suspended from a gram balance resting on top of the oven, and continuous time-vs-weight readings were taken. Natural circulation of air prevailed. The oven contained two opposing banks of 250-watt reflector lamps, which could be operated singly in one-sided radiation or jointly in two-sided radiation. A sketch of the oven is shown in Fig 3. A schematic drawing of the continuous oven with both front and side views is shown in Fig 4. Cloth was wetted in a tank and passed through a hand roller prior to being wound on the tension roll at A. Initial moisture contents could be partially controlled by changing the pressure on the rollers of the hand wringer. It was not possible to obtain initial moisture contents with the wringer as low as those obtained commercially. In order to obtain low moisture contents, the wet cloth was passed through the oven at velocities high enough to take out the water partially and thereby to reach lower moisture contents. From A the cloth passed under roll B and up through the oven countercurrent to the flow of the air. At the top of the oven the material passed over roll C and to the drive rolls D. From D the cloth dropped onto a scale at E where continuous readings were made. The use of a variable-speed Reeve's drive in conjunction with variable-diameter pulleys permitted speeds ranging from 4-70 feet per minute.

The direction of the air flow is also shown. In the majority of runs the outlet at F was kept closed, and air was exhausted from the bottom slot, through which the cloth passed into the oven. Some air entered at the top slot where the cloth left the oven and large amounts of leakage occurred at other spots. With the 250-watt lamps, the air temperature averaged 185 ± 10°F, while with 375-watt lamps the values were 225 ± 5°F.

In beginning a run the oven was allowed to heat up until it reached a temperature somewhat in excess of the equilibrium temperature during drying. The cloth was stapled to a copper screen threaded through the oven and rollers started. Fresh air was allowed to enter the oven and bring it approximately to the equilibrium temperature of the run. When the cloth came through, the screen was removed and weighings begun. In Fig 5, the type of data obtained in the experiments is illustrated. Cumulative weight of cloth was plotted against time at a particular velocity along with the calculated cumulative weight of dry cloth at the same velocity. The difference between these two curves represented the accumulated moisture which had not been evaporated. As the speed was lowered, the wet and dry curves approached each other until they coincided at the velocity at which water was just completely evaporated. Below this velocity all curves coincided with the dry curve. When the wet curve was perfectly straight, equilibrium conditions had been reached and the exit moisture content could be determined. In all runs the wet curve was straight from the start at zero time.

The region of maximum intensity under the lamp bank was 4 feet long and the hot-air section preceding and following the lamp bank occupied a few additional inches. In the experiments performed, the time any section of cloth remained in front of the four-foot radiant section ranged from four seconds to one minute.

The intensity pattern for the radiant section was determined with 250-watt lamps

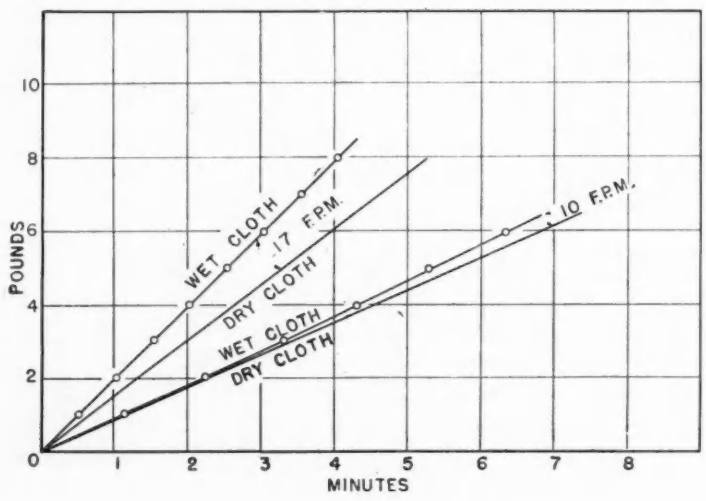


Figure 5
Accumulative Weight vs Time

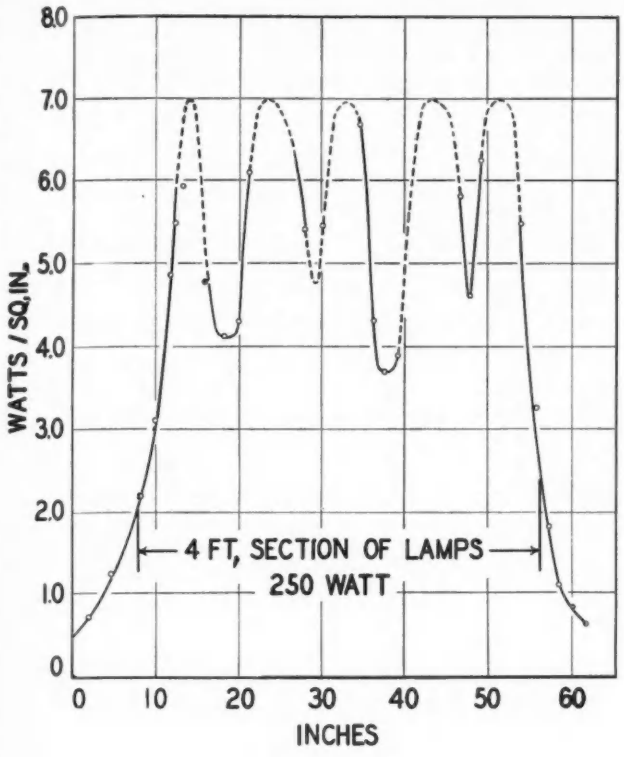


Figure 6
Intensity Variation Throughout Continuous Oven

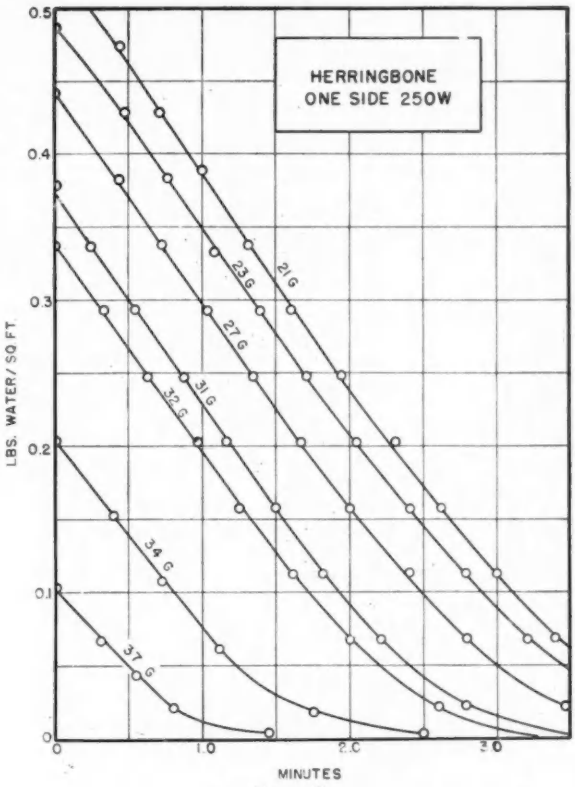


Figure 7
Moisture Content vs Time For Undyed Herringbone Twill

and is shown in Fig 6. It can be seen that the intensity was by no means uniform. However, with continuously moving cloth, the variations in radiant intensity were smoothed out since all portions of the cloth passed through both the regions of maximum and minimum intensity. While the radiation covered a range of 62 inches, the region of maximum intensity was confined to a section 48 inches in length. The average intensity over this region was approximately 5.8 watts/sq in.

The interpretation of data obtained from the continuous oven presented greater difficulties than with the data from the stationary oven. Since it is only possible to obtain the final cumulative weight of the cloth, all conclusions had to be based on this information in contrast to the complete drying curves available from the stationary oven. In the continuous pilot-plant oven, it was not possible to differentiate between the heating-up, constant-rate, and falling-rate periods. The rates of evaporation obtained from initial and final moisture contents only represent averages over the three periods of drying.

EXPERIMENTAL RESULTS FOR STATIONARY OVEN

INITIAL MOISTURE CONTENT——A large number of experimental runs on different kinds of textiles were made in the stationary oven in order to compare the rates of drying as affected by the thickness, initial moisture content, weave, and color. The primary information was obtained in the form of moisture content vs time data. In Fig 7 are shown a series of runs taken with an undyed herringbone-weave cotton cloth, 76 x 48 thread count, having a weight of 0.0517 lb/sq ft (2.15 sq

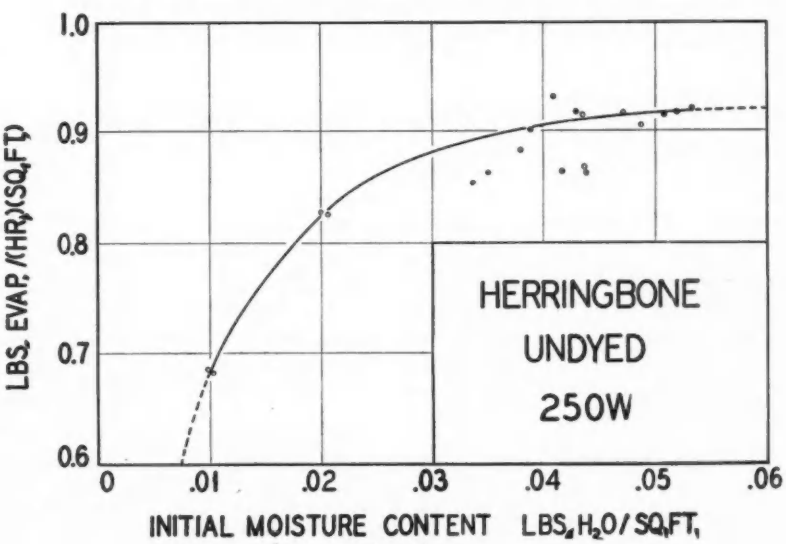


Figure 8
Rate of Drying During Constant Rate Period vs Initial Moisture Content For Data of Fig 7

TABLE III
HERRINGBONE WEAVE, 2.15 sq yds/lb

Run No	Dye Class and Color	Initial Mois Content Lb water/ 100 lb cloth	Rate Lb evap/ (hr)(sq ft)	Air Temp, Deg F	Color Factor
From Fig 11	none	95.0	0.93	...	0.68
48G	direct tan	104.2	0.98	138-142	0.71
44G	direct pink	99.2	0.997	136	0.73
46G	sulfur khaki	66.2	1.032	139-141	0.76
47G	sulfur tan	93.5	1.147	139-143	0.84
49G	vat green	94.0	1.200	140-142	0.88
64	vat olive green	114.6	1.220	137-139	0.89
50G	vat blue	106.5	1.280	140	0.93
43G	sulfur green	77.3	1.300	140-144	0.95
51G	sulfur brown	67.5	1.315	142	0.96
52G	sulfur navy blue	70.1	1.368	139-141	1.00

yds/lb) under a single bank of 250-watt lamps having an intensity of about 3.4 watts/sq in. The runs were taken with different initial moisture contents in order to study the absorption of radiation as affected by the total water present. The data are typical of normally encountered drying curves in that there is a short, in some cases negligible, heating-up period, followed by constant-rate-of-drying and falling-rate periods. The maximum rates of evaporation as calculated for the constant-rate period are shown in Fig 8 as a function of the initial moisture content. The constant rate of drying drops from a high of 0.93 to 0.681 lb/(hr)(sq ft) in the range of moisture contents investigated, indicating that the radiation absorbed is a function of the water content. To obtain an idea of the quantity of water present, it should be noted that if the maximum amount of water corresponding to 0.05 lb/sq ft were spread in a continuous film, the layer would be almost 0.2 mm thick.

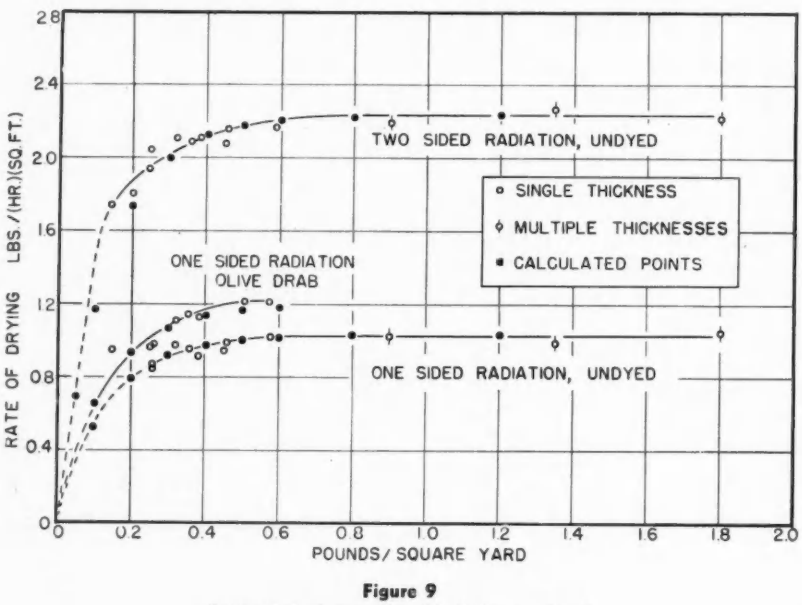


Figure 9
Rate of Drying vs Dry Cloth/Square Yard

CLOTH COLOR——The color of the cloth has an important effect on the rate of drying. The same herringbone cloth used in Fig 7 was dyed a series of different colors and dried with a single bank of 250-watt infrared lamps. In Table III a summary of the results is presented. The color factor given in the last column represents the ratio of the rate of drying during the constant-rate period of the dyed cloth to the maximum rate for the most absorptive (navy-blue) cloth. From the table it can be noted that the absorption of radiation is increased about 50% in going from undyed to the darkest cloth. The fact that all the initial moisture contents are not identical, limits the value of the color factors as far as quantitative comparisons are concerned.

CLOTH WEIGHT/UNIT AREA——The rate curves for a series of undyed and olive-drab cloths having different weights/unit area were determined with both one-sided and two-sided radiation employing 250-watt lamps. The results for the undyed cloths are tabulated in Table IV. While both weave and weight per square foot affect the absorption of the radiation, the cloth weight is the more important of the two. The data of Table IV and data for olive-drab cloths are plotted in Fig 9 in the form of rate of drying during the constant-rate period against the cloth density in lb/sq yd. The lightest cloth was a print having a density of 0.144 lb/sq yd and the heaviest was tent twill at 0.58 lb/sq yd. In order to obtain higher densities, herringbone cloth was dried in multiple thicknesses. While the use of several thicknesses is not the same as the use of a heavy undivided cloth, the results appear to be consistent. The weave and thread count varied from cloth to cloth.

Figure 9 is useful for predicting the amount of radiation that will pass through a given thickness of cloth. It appears that if a density in the neighborhood of 0.5 to 0.6 lb/sq yd is employed, there will be only a small amount of radiation transmitted. If print cloth at 0.144 lb/sq yd were being dried, about 20% of the radiation would be

TABLE IV

Name	Sq yds/ lb	One Bank Initial Mois Content, lb Water per sq ft and 100 lb of cloth		Air Temp, Deg F	Rate lb evap/(hr) (sq ft)	Two Banks Initial Mois Content, lb Water per sq ft and 100 lb of cloth		Air Temp, Deg F	Rate lb evap/ (hr) (sq ft)
		Run No				Run No			
Print	6.95	..	....	....	....	126	0.0188	122.6	184-186	1.74
Jeans	3.93	56	0.0303	105.0	134-135	0.850	123	0.0319	112.4	184-188	1.94
Sheeting	3.83	57	0.0364	112.8	137-139	0.860	124	0.0330	112.5	183-186	2.05
Twill	3.12	54	0.0420	115.0	136-137	0.973	121	0.0492	135.0	182-188	2.11
Poplin	2.80	53	0.0365	92.1	135-136	0.958	120	0.0352	90.0	188-190	2.09
Drill	2.60	58	0.0440	103.2	135-136	0.918	125	0.0436	103.2	180-184	2.11
Herringbone	2.22	55	0.0525	104.8	136-140	0.974	13G	0.0401	80.1	300-304	2.08
Army Twill	2.18	61	0.0475	94.4	135-136	0.990	128	0.0507	100.8	184-192	2.16
Tent Twill	1.70	60	0.0632	96.6	138-140	1.020	127	0.0615	94.0	182-188	2.17
Herringbone	2 thicknesses	4G	0.0768	77.3	202-206	1.020	10G	0.0804	80.9	309-312	2.20
Herringbone	3 thicknesses	6G	0.1195	80.0	208-214	0.998	8G	0.1237	81.8	308-315	2.28
Herringbone	4 thicknesses	15G	0.1680	81.0	192-201	1.050	18G	0.1620	79.5	302-306	2.22

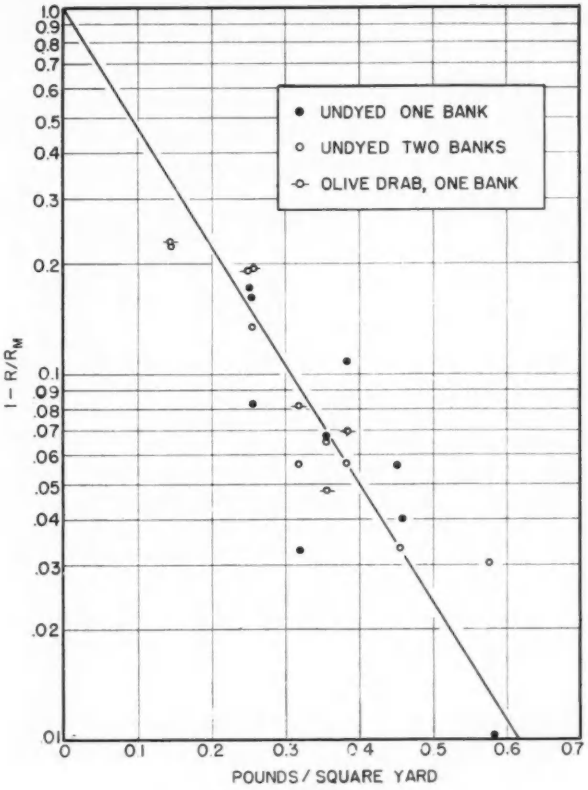


Figure 10
Rectification Of Data In Accord With Eq [6]

transmitted without absorption in the cloth. To cut down the radiation lost in this manner, multiple passes should be employed in a continuous oven. Three to four passes of any of the cloths investigated would be enough to cut the transmitted radiation to a small value. While the transmitted radiation in being converted to convected heat is not completely lost, its effectiveness is reduced.

The data of Fig 9 may be approximately fit to the following equation, which represents a modification of Lambert's exponential extinction law

$$R = R_m(1 - e^{-mx}) \qquad [5]$$

where R is the rate of drying for a cloth of density x lb/sq yd and R_m is the maximum rate of drying reached for large values of x. Eq [5] can be placed in the form

$$-mx = \ln (1 - R/R_m) \qquad [6]$$

On Fig 10 the data of Fig 9 are rectified according to the previous equation. The points are widely scattered and are particularly sensitive to small variations in the rates. In spite of inaccuracies involved, Eq [5] can be used for predicting the rates with less than an average error of 3% and a maximum error of −13%. The value of m as obtained from Fig 10 is 7.5.

The rates obtained with two-sided radiation were approximately 10% greater than twice the rates for one-sided radiation. This is due to the increase in air temperature and greater rate of natural circulation.

CONTINUOUS PILOT-PLANT OVEN ——The greater portion of the investigations involving the continuous oven were concentrated on a blue gabardine cloth having a density of 0.466 lb/sq yd. The cloth itself was 19.5 inches wide and approximately 235 feet long. Two-sided radiation employing both 250 and 375-watt lamps was used with this cloth. Less extensive data were obtained for white print (0.168 lb/sq yd) and white flannel (0.194 lb/sq yd) cloths with the 375-watt lamps. A few runs were made with miscellaneous materials including tan gabardine (0.458 lb/sq yd), blue-green print (0.208 lb/sq yd), tan print (0.208 lb/sq yd), and a gray twill (0.480 lb/sq yd).

The first runs were made with 375-watt lamps, two-sided radiation, and blue gabardine cloth. As shown in Fig 11 the total accumulative weight of cloth emerging from the oven was plotted against time with constant initial moisture contents. As the speeds decreased, the final moisture content diminished until at 11.6 feet per minute the cloth left the oven completely dry. It is apparent from the straightness of the lines that equilibrium conditions were rapidly attained. The data in Fig 11 along with similar runs taken in an oven with 250-watt lamps for blue-green print, tan print, tan gabardine, blue gabardine and gray twill are summarized in Fig 12 in the form of exit moisture content vs conveyor speed for approximately constant initial moisture content.

The drying time was arbitrarily calculated

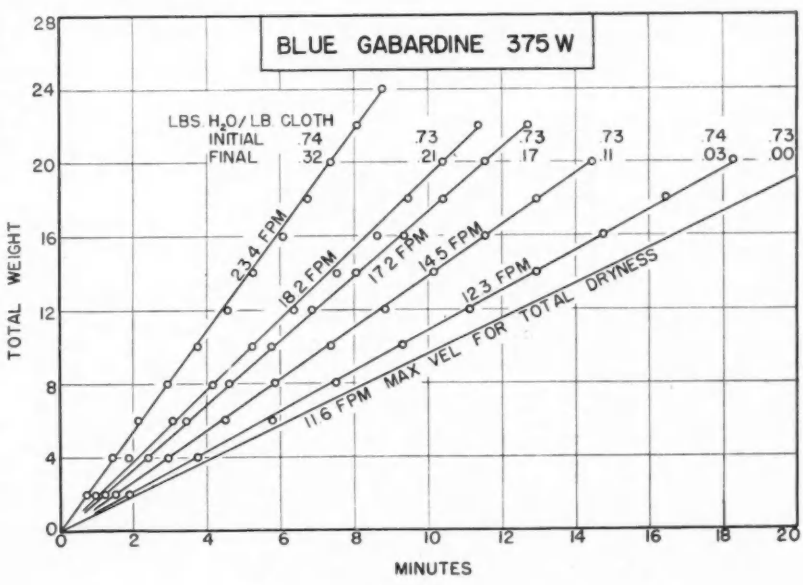


Figure 11
Accumulative Weight vs Time At Various Speeds

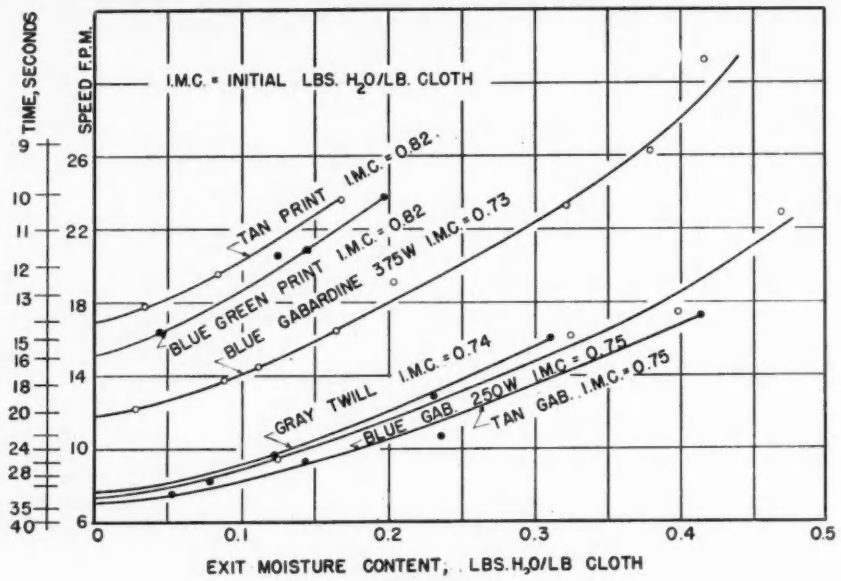

TIME, SECONDS
SPEED F.P.M.
I.M.C. = INITIAL LBS. H2O/LB. CLOTH
TAN PRINT I.M.C. = 0.82
BLUE GREEN PRINT I.M.C. = 0.82
BLUE GABARDINE 375W I.M.C. = 0.73
GRAY TWILL I.M.C. = 0.74
BLUE GAB. 250W I.M.C. = 0.75
TAN GAB. I.M.C. = 0.75
EXIT MOISTURE CONTENT, LBS. H2O/LB CLOTH

Figure 12
Exit Moisture Content vs Cloth Speed

as the number of seconds required to pass the four-foot radiant section and was obtained by dividing the length (four feet) by the cloth speed. Thus, the time in seconds equaled 240/V where V = velocity in feet per minute.

The relative position of the curves in Fig 12 depends upon the weight and color of the cloth. Thus the light print cloths were completely dried at the highest speeds in the neighborhood of 14-18 ft/min, while the heavier cloths required slower speed. It can be observed that the color in the case of the print and gabardine had a marked effect on the drying curves as was previously indicated in the stationary tests. All the curves in Fig 12 except the one marked 375 watts were obtained with 250-watt lamps.

With the higher-intensity 375-watt lamps, the time required to effect a given reduction in moisture was less than that required by the 250-watt lamps. It might be expected that the wattage would have a direct relationship to the relative speeds or drying times. Reference to Fig 12 shows that the ratio of the speeds are very nearly the same as the ratio of the wattages. If the speeds for the blue gabardine, 250-watt curve are multiplied by 1.5, the resultant curve will nearly coincide with the 375-watt curve. This indicates that the rates and times of drying are in approximately the ratio of 3 to 2 for the 250- and 375-watt lamps. More extensive tests indicated that the oven performance for either wattage lamp could be accurately predicted from data taken with the other lamp. These relationships would be altered in any case where the convection effects were large compared with the radiation.

Difficulties were encountered in attempting to obtain constant initial moisture contents for data similar to that of Fig 12, and another method was adopted for the major portion of the experimental runs. Maintenance of speed at a fixed value while the initial moisture contents were varied lead to the curves of Fig 13 for blue gabardine cloth.

The final moisture content was plotted against initial moisture content at constant speeds, a series of lines having a slope in the straight portion of nearly 45° resulting. Both 250- and 375-watt lamps were used in obtaining the data. The speeds in feet per minute are listed with each drying curve, and in addition the speeds for the 250-watt runs

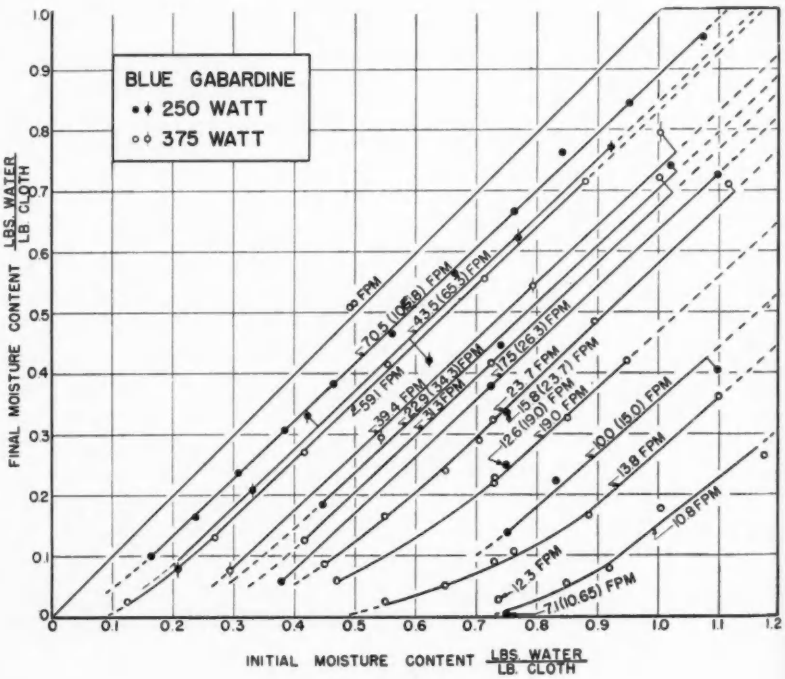


Figure 13
Final vs Initial Moisture Content, Blue Gabardine

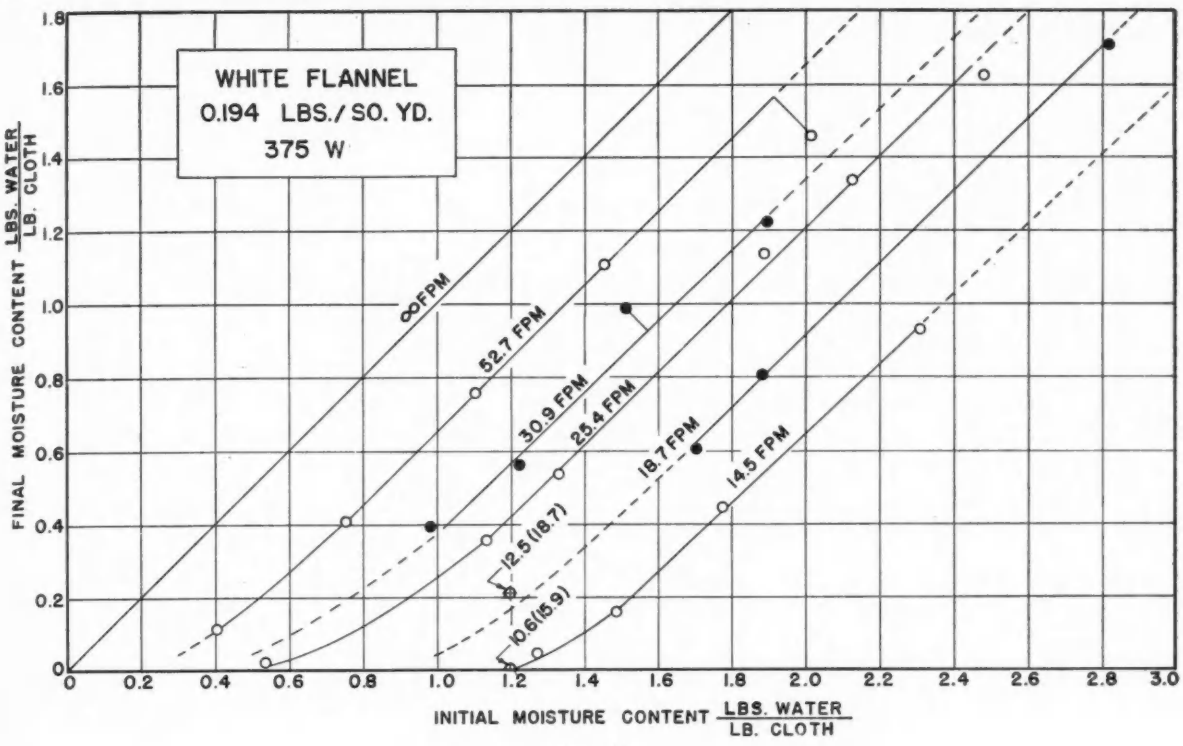


Figure 14
Final vs Initial Moisture Content, White Flannel

are shown in parentheses multiplied by 1.5. The 250-watt speeds multiplied by 1.5 give the speeds which would yield precisely the same experimental curves with 375-watt lamps. On the other hand, if the 375-watt speeds are multiplied by two thirds, the curves may be used for predicting results that would be obtained with 250-watt lamps. The top curve marked ∞ FPM represents the limiting conditions under which the exit moisture content leaving the oven is equal to the initial moisture content. In Figs 14 and 15, plots for white flannel and white print cloths are shown. They are similar in all respects to Fig. 13 except that the rate of energy absorption is less since they are thinner and of lighter color than the blue gabardine.

It can be shown in the following manner that, if the rate of drying is constant, the curves of final moisture content vs initial moisture content are 45° lines. Suppose in Fig 16 that a cloth enters the oven with W_o lb moisture/lb cloth and comes out with W_1 lb moisture/lb cloth. Suppose further that the cloth with moisture content W_1 is returned to the oven and then exits with moisture content W_2. If the rate of drying remains the same for the two passes through the oven, then the moisture reduction W_o-W_1 will equal W_1-W_2. If W_o-$W_1 = W_1$-W_2, then AB will equal CD in Fig 16, and the line BD will be parallel to the 45° line. At point E where deviation from the 45° line begins, the falling-rate period is encountered.

In Fig 17 the data of Fig 13 have been replotted on the basis of final moisture content vs the time of exposure to radiation in seconds. The times for the 250-watt points were plotted as two thirds of the actual values. The falling of points for both the 250- and 375-watt lamps along smooth

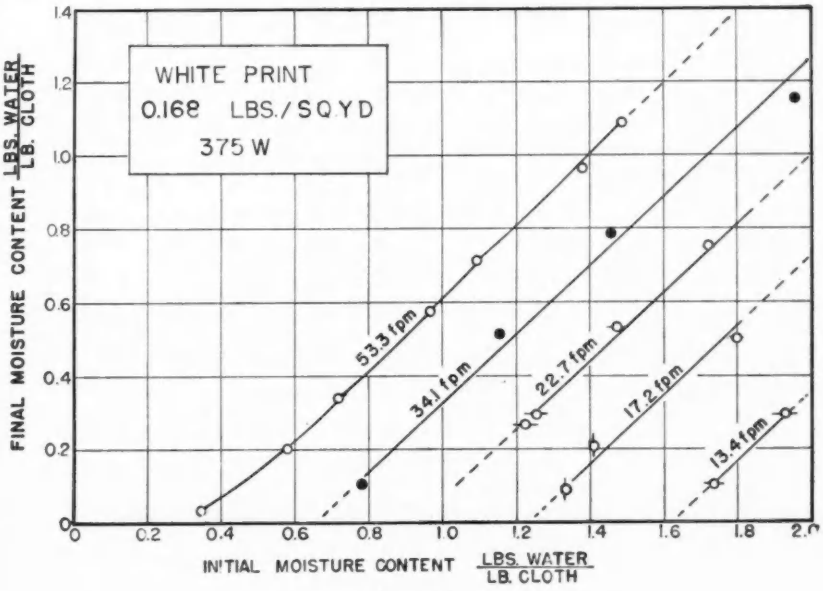


Figure 15
Final vs Initial Moisture Content, White Print

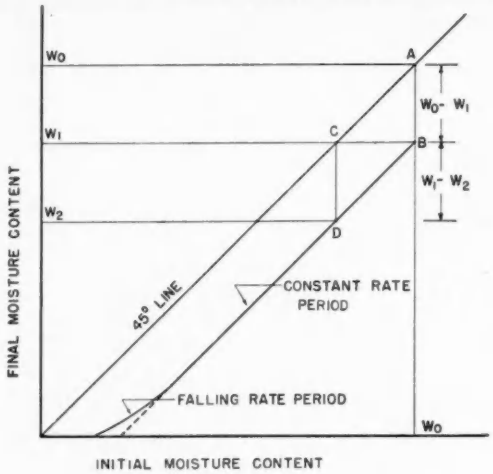


Figure 16
Final vs Initial Moisture Content

curves substantiated the relation that the rates of drying are directly proportional to the wattage of the lamps. This is in contrast to the stationary-oven tests where doubling the intensity increased the rate of drying by a factor of about 2.2. However, in the stationary oven the heat transmission from the hot air was relatively of more importance and accounted for the factor of 2.2 instead of 2.0. The drying curves of Fig 17 are quite similar to the data of moisture content vs time shown previously for the stationary tests. There is a constant-rate followed by a falling-rate period, the heating-up part appearing to be of negligible importance. In Fig 18, drying curves for the white flannel as derived from Fig 14 are illustrated. They are similar to the data of Fig 17.

OVEN EFFICIENCIES——Fig 19 shows the lb of water evap/KWH (a measure of drying efficiency) plotted as a function of initial and final moisture contents. The solid portions of the curves represent the experimental drying conditions for the cloths studied, values of 1.20 to 1.65 lb of H_2O evap/KWH being realized. It can be seen that a maximum evaporation/KWH may be obtained for a given initial moisture content, but relatively low values will result if the heat-up and falling-rate period are not avoided. The explanation of the lowered efficiencies is as follows: Consider first the drying of cloth to a small extent. Here, most of the KWH input is utilized by heating the cloth and elevating the temperature of the water in the cloth to its evaporation temperature. Next, consider drying the cloth to an extremely low final moisture content. In this case the falling-rate period is encountered; and, although the radiant input remains constant, the rate of drying decreases, and a lower evaporation is obtained in terms of lb/KWH.

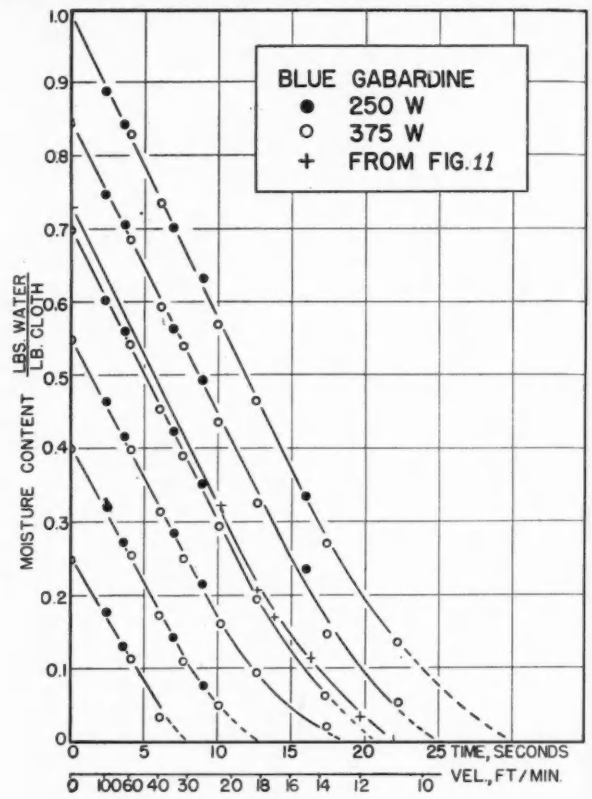


Figure 17
Moisture Content vs Time Obtained From Fig 13

The values for Fig 19 were calculated from values obtained from Fig 17 and were based on blue gabardine cloth for 250- and 375-watt lamps. To calculate the lb of water evap/KWH, the drying times were obtained at various final moisture contents for constant initial moisture content from Fig 17. The drying times thus obtained were converted to input in kilowatt hours. By dividing lb of water evaporated by the corresponding KWH value, the resulting lb of water evap/KWH was obtained. For example, with initial and final moisture contents of 1.00 and 0.30 lb water/lb cloth, the time of drying was 16.7 seconds for 375-watt lamps. The dry-cloth density was 0.0518 lb/sq ft and the cloth width was 19.5 inches. The power input was 30 KW with 80 lamps. To find the total lb evaporated, it is necessary to calculate the lb of dry cloth passing through the oven in 3600 seconds. The velocity for the 4-ft oven section was 4/16.7 or 0.239 ft/sec. The lineal feet passing through the oven in one hour was then (.239)(3600) or 859 feet, corresponding to (859)(19.5/12) sq ft per hour or 72.4 lb/hr of dry cloth. The lb evaporated per hour equals (1.0-0.3)(72.4), or 50.7. Thus, the lb evap/KWH becomes (50.7)/(30), which equals 1.69.

An approximated thermal efficiency may also be calculated for any particular drying condition, if certain assumptions are made. First, it may be assumed that the cloth entered the oven at an average temperature of about 80°F. Second, calculations indicated that the temperature during the constant-rate period was close to 140°F. Third, the cloth was assumed to have a specific heat equal to that of cotton (0.33 Btu/lb/°F). The heat required to evaporate $W_1 - W_2$ lb water per lb cloth (where W_1 and W_2 correspond to initial and final moisture contents) is equal to the following expression:

Heat Required = Sensible heat of cloth + sensible heat of water + latent heat

$$Q = 0.33(180 - 140) + W_1(140 - 80) + (W_1 - W_2)I_v$$

where I_v = heat of vaporization of water at 140°F. The theoretical Btu per lb of water evaporated can then be obtained by dividing Q by $W_1 - W_2$. Since there are 3416 Btu/KWH, the theoretical pounds evap/KWH, P, becomes:

$$P = \frac{3416\ (W_1 - W_2)}{19.8 + (60 + I_v)\ W_1 - W_2} \quad [7]$$

Recalling from Fig 19 that the actual lbs water evap/KWH were plotted against final moisture contents at constant initial moisture contents, the thermal efficiency of dry-

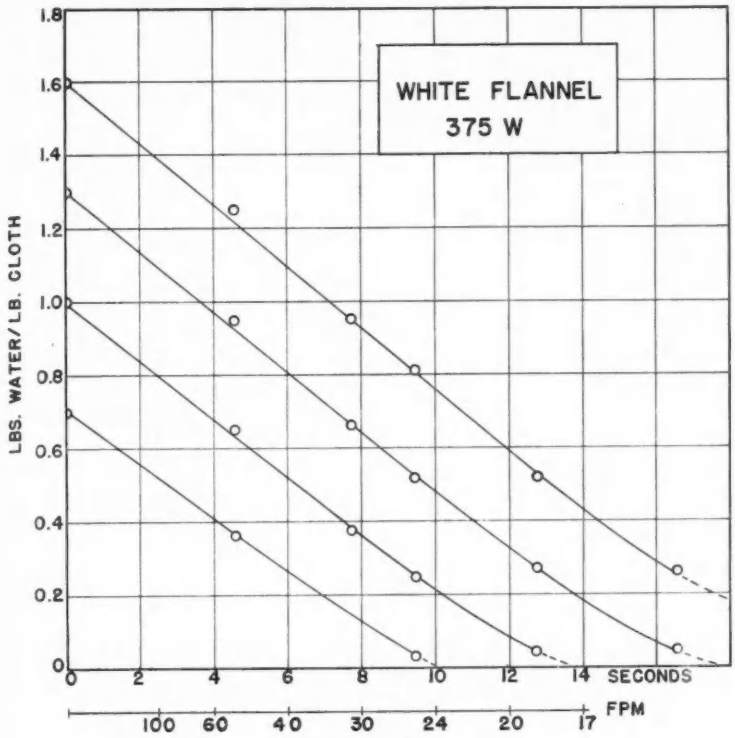


Figure 18
Moisture Content vs Time Obtained From Fig 14

with the other stated improvements, the efficiency of industrial ovens might be increased to 70%. The remaining 30% of energy would appear as sensible heat, part of which could be further utilized. With the addition of forced-air circulation at the dry end, still higher thermal efficiencies should be possible.

In addition to the high thermal efficiencies which may possibly be obtained, the intense heat density permits high evaporation rates and small equipment. With the blue gabardine cloth in the 375-watt oven, the rates of evaporation were in the neighborhood of 7 lb/(hr)(sq ft). An undyed white cloth would probably give about 25% less absorption of radiation and this would correspond to a maximum efficiency of around 50-55%, as compared with 70-80% for a very dark cloth. The design of the oven must take into account the absorptivities of the cloth. With light-colored cloths, where less radiation is absorbed, more attention must be focused on the efficient utilization of the convectional heat.

NOMENCLATURE

A = Overall absorptivity, ratio of the rate of absorption per square foot of radiation to the incident intensity, dimensionless.
h = Coefficient of heat transfer, Btu/(hr)(sq ft)(°F).
I = Intensity, Btu/(hr)(sq ft).

ing may now be approximated. For example, assume a cloth entering the oven contains 1.00 lb water/lb dry cloth and leaves with 0.3 lb water/lb dry cloth. The actual lb evap/KWH from Fig 19 equals approximately 1.69, and, from Eq [7], the theoretical value is 3.03. The resulting efficiency is calculated as 55.8%.

The 55.8% efficiency represents a typical value obtained in the experimental oven and is undoubtedly lower than an efficiency that would be obtained from an industrial oven designed to minimize heat losses. The main causes of lowered efficiencies were poor insulation, air leaks, and effective radiation area. The blue gabardine cloth was 19.5 inches wide whereas the radiation was effective over a width of 22 inches. Consequently, more evaporation would have occurred with a cloth of proper width. Multiplication of 1.69 by 22/19.5 gives 1.91 lb water evap/KWH, which is closer to the true performance figure for the experimental oven. The value of 1.91 corresponds to an efficiency of 63.0%. A wider industrial oven would have a smaller percentage of lost radiation due to "spill over" at the sides than the experimental oven. It might also allow several passes through the oven and thus permit a greater percent absorption of the radiation. By selection of the proper entering and exit moisture contents along

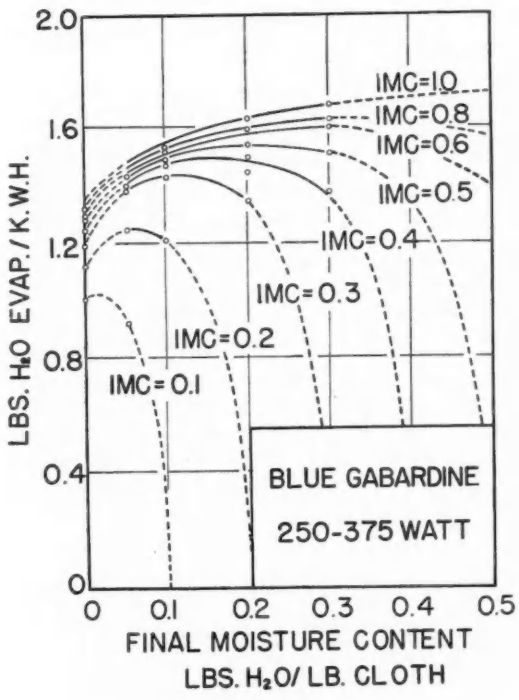


Figure 19
Pounds Evap/KWH For Blue Gabardine

k = Diffusion coefficient, lb/(hr)(sq ft)(atm).
l_v = Latent heat of water, Btu/lb.
m = Slope defined by Eq[6], sq yards/lb.
p = Partial pressure of water vapor at interface, atm.
p_a = Partial pressure of water vapor in air, atm.
P = Pounds evap per KWH.
R = Rate of evap for cloth of variable thickness, lb/(hr)(sq ft).
R_m = Rate of evap for cloth of infinite thickness, lb/(hr)(sq ft).
T_a = Air temperature, °F.
T_o = Initial temperature, °F.
T = Temperature of cloth during constant rate of drying, °F.
X = Cloth density, lb/sq yard.
W_o, W_1, W_2 = Moisture contents, lb water/lb dry cloth.
Q = Heat required to heat one lb of cloth to 140°F and to evaporate $(W_1 - W_2)$ lb of water, Btu/lb of dry cloth.

ACKNOWLEDGMENT

The author wishes to thank Paul H Goodell of the Jensen Specialties, Inc, of Detroit, Michigan for furnishing the Trumbull ovens in which the textile-drying experiments were made. Carl Egeler of the Nela Park Division of the General Electric Company supplied the reflector lamps used in the radiant oven. C Norris Rabold of The Erwin Mills, Inc donated extensive numbers of cloth samples for the program. The experimental program was sponsored jointly by the Trumbull Elec Mfg Co of Norwood, Ohio and the Nela Park Division of General Electric. The work was done in the Chemical Engineering Laboratories of Vanderbilt University.

The authors wish to express their appreciation to Marshall Cherry, Richard Manne, Henry James, C J Waddle, Donald Correll, G E Hoagland, George Wilson, David Griffin, J R Simms, J P Simpson, H E Monroe, W C Jenkins, José Rosado and Robert Wolle for help in obtaining experimental data.

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Perchloric-Acid Method—

(Concluded from Page P850)

mono- and disodium phosphates and analyzed for starch by the perchloric-acid method. Aliquot samples of each paste were removed at various times and analyzed for starch. Figure 5 shows the progress of the enzyme action at the various pH values. At the optimum pH values of 6.1 and 6.65, the speed of reaction and percentage conversion of starch gum is highest. Figure 6 shows more clearly the optimum pH range of 6-7.

REFERENCE

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Research—

(Concluded from Page P853)

been filed and subjected to statistical analysis. The committee recommends the adoption and early publication of these results. The data will shortly be circularized to the Research Committee for comment, it was stated.

C A Sylvester, chairman for the Subcommittee on Fastness to Washing stated that, at this time, there is nothing to report for the wool division except that many tests have been made which must now be reviewed. He added that mole tests are needed in connection with methods for manufactured fabrics. The wash tests which appear in the 1951 *Year Book* will go to ISO, including the new method III-A, with one change in the method of evaluation. The committee recommends that the standard dyeings be used only for evaluating alteration in shade due to washing but that staining be reported by reference to the AATCC color transference chart.

J E Norton of Atlas Electric Devices stated that he had recently attended a meeting of the Canadian Association of Textile Chemists and Colourists and that they are considering writing and publishing test methods similar to those we distribute. They expressed great interest in our methods and are planning an annual meeting in Montreal in April with exhibits of their test methods.

There being no further business, Mr Little closed the meeting at 3:23 pm.

Those present were:

L S Little, *Chairman*
H W Stiegler, *Research Director*
G H Schuler, *Secretary*

W D Appel, M J Babey, J R Bonnar, K S Campbell, C W Dorn, C Z Draves, G R Ferguson, H E Hager, T G Hawley, Jr, W A Holst, G H Hotte, R W Jacoby, M H Klein, J E Lynn, J E Norton, B A Ryberg, J A Stevenson, C A Sylvester, P Theel, F V Traut, S G Turnbull, Jr, J F Warner, P J Wood, J A Woodruff, H L Young, J A Zelek.

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Agitation—

(Concluded from Page P852)

of each fiber is equal to the concentration of dye on the surface of each fiber. The fact that dyeing, in the initial stages, takes place in a ring fashion has previously been shown by Royer *(4)* and others. The method by which the disappearance of this ring could be determined has been presented by Skinkle and Sumers at a Northern New England AATCC meeting. The measurement of this characteristic is dependent upon an interrelationship between the transmission of a dye solution and the reflectance of a corresponding dyed fabric.

It is known that dyeing is governed by two factors: the rate of deposition of dyestuff from the solution onto the fibers and the rate of diffusion of the dye particles into the individual fibers. In the initial period, while the concentration of dye on the surface is greater than the concentration of dye inside the fibers, the rate of dyeing is governed by the speed at which the dye particles diffuse into the fibers. However, after the ring disappears, the rate of diffusion becomes greater than the rate of deposition and the rate of deposition becomes the controlling factor in further dyeing. In other words, in the initial period additional particles cannot deposit until those present on the surface move to the interior and make more sites available, while in the latter stages sites are always available but the concentration of dye in the solution has by now been greatly decreased and deposition, by mass action, decreases also.

Table II shows that doubling the amplitude of the shaker increases the length of time before the ring disappears. This indicates a decrease in the rate of diffusion of the dye into the fibers. Since the rate of diffusion is proportional to the difference in concentration inside and on the surface of the fibers, and the concentration in the interior is initially zero, this increased agitation must have reduced the concentration of the dye on the surface of the fibers. Table II also shows, however, that the manner in which the agitation is applied to the dyebath is at least as important as the amount of the agitation. Further work on this aspect is obviously needed.

The work reported here is the first step in a continuing project on the qualitative as well as quantitative effects of agitation on dyeing rates. It is planned to continue the work with different forms of agitation, different classes of dyes, and with different fibers.

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ONE HUNDRED AND SEVENTY-EIGHTH COUNCIL MEETING

THE Council held its 178th meeting in the Hotel Statler, New York, N Y, on Wednesday morning, October 17, 1951. Present were President C Norris Rabold, presiding; J Robert Bonnar and George O Linberg, vice presidents; William R Moorhouse, treasurer; Leonard S Little, chairman of the Research Committee; Carl Z Draves, Thomas R Smith and P J Wood, past presidents; Edward B Bell and John M Gould representing Northern New England; Edward J Allard, Raymond W Jacoby and Robert W Joerger representing Rhode Island; J Edward Lynn representing Western New England; Carl H Brubaker, Charles W Dorn, Ralph M Fischer and Henry L Young representing New York; Albert E Herrmann, Jr, representing Hudson-Mohawk; Morton H Klein, A E Raimo, Arthur K Saville, Richard B Stehle, Frederick V Traut and Jackson A Woodruff representing Philadelphia; John B Neely, Linton C Reynolds, Henry A Rutherford and Sumner H Williams representing Piedmont; C Russell Gill representing Southeast; Glenn R Bellamy representing South Central; Joseph H Jones representing Mid-West; Charles K Bishop representing Pacific Northwest; George S J White of the Society of Dyers and Colourists; William A Holst, Jr of the Technical Program Committee; Albert E Sampson, assistant treasurer; George H Schuler and Glenn D Jackson, Jr of the Publicity Committee; Percival Theel of the Publications Committee; Harold W Stiegler, research director; Walter F Fancourt, III, Joseph Lindsay, Jr, M M McCann, Raphael E Rupp, and Harold C Chapin, secretary.

Mr Dorn extended a welcome from the New York Section to what promised to be the largest convention in the history of the Association. Mr White brought greetings from various groups in England.

The secretary's report of the 177th Council meeting and financial report of October 5, and the treasurer's annual report of July 31, were accepted.

For the Publicity Committee, Mr Schuler announced the innovation of a luncheon immediately following the Council meeting, for the purpose of introducing officers of the Association to the press.

Professor Theel reported that through new arrangements no paper delivered before a meeting would wait hereafter more than six months for publication in the *Reporter*. The Publications Committee had chosen the recipients of the first American Dyestuff Reporter Award, who were to be announced at the convention banquet. Attention was called to better arrangement, by Mr Cady, of the dye list in the *Year Book*. Dr Draves had already sent questionnaires to manufacturers with view to revision of the Textile Chemical Specialties list in the 1952 book. Manuscript of the pamphlet on Dyehouse Mathematics was complete except for final editing. The monograph on Vat Dyes was practically ready for the printer. Mr Sampson had been appointed Chairman of a special committee to investigate quality and sources in this country of paper for the *Colour Index*. Mr Cady had sent data on 750 dyes to the editors in England, and hoped to have all this work completed before the end of the year.

A proposed new bylaw on the organization and duties of the Committee on Conventions, which had been mailed to the Council in the agenda for the meeting, was discussed by Mr Barnard. It was approved in principle, and referred to the Committee on Constitution and Bylaws for revision in detail and report at the November Council meeting.

Mr Bonnar stated that the president's Advisory Committee had discussed desirability of a manager for certain parts of Association work, and would report at the November meeting.

Mr Little announced plans for an international meeting on standards in New York next June, and said preparatory correspondence with the British was already under way, particularly on light fastness and color transfer standards.

Mr Linberg discussed further plans for solicitation of funds, through Corporate membership, for research. For his committee on experience requirements for Senior membership, he recommended counting graduation from a textile school of college grade, with specialization in chemistry and dyeing, as the equivalent of two years practical experience; graduation from any other college course, with specialization in chemistry or other physical sciences, as the equivalent of one year experience, and an advanced degree in such subjects as equivalent to another year. The committee recommended acceptance of a year in the Armed Services of the United States in place of a year of textile experience. They advised restricting the sum of all such allowances to three years out of the five years experience specified in the Constitution. It was so voted, for the informal guidance of the Committee on Membership and Local Sections.

Elected to Corporate membership were the Drexel Knitting Mills Co and Chatham Manufacturing Co. Each of the following was elected to the class of membership specified, as of thirty days from publication of application, provided no objection be received meanwhile by the Secretary.

SECRETARY'S FINANCIAL REPORT—OCTOBER 31, 1951

Received and transmitted to Treasurer	*Applications*	*Dues, Regular & Reinstate*	*Dues, Corporate & Sustaining*	*Miscellaneous*	*Totals*
August 1 to October 5, 1951	$ 693.50	$ 132.00	$ 500.00	$2,750.99	$ 4,076.49
October 5 to 31, 1951	488.50	18,980.00	572.50	1,267.67*	21,308.67
Total in fiscal year to October 31	1,182.00	19,112.00	1,072.50	4,018.66	25,385.16
Leaving deposited by Treasurer with Secretary					3,701.53
Miscellaneous items					*
Dividends					$ 209.90
Reporters and reprints					5.80
Year books					447.10
Crockmeters					82.87
Crock cloth					87.75
Moth cloth					18.75
Water test apparatus					12.70
Dyed standards					12.00
Knitted tubing					.80
Gas fading units					1.00
Buttons					6.00
Color transfer chart					2.50
Flammability apparatus blueprint					1.00
Colour Index					30.00
Analytical Methods					349.50
					$1,267.67

H C CHAPIN,
Secretary.

Senior

R D Andersen
J R Atkin
W E Backus
J W Binns
R H Blaker
R J Bolin
G J Bonifanti
R J Boswell
J A Bowdler
T E Braconier
W H Breitenbach
J A Brooks
W W Bussey
T H Caldwell, Jr
R T Clarke
S T Clary
E C Cook
A B Crooks
I Duffen
W G Dunning
A R Eanzel
S M Fagan
W O Fischer
E W Fitch
P N Fletcher
A J Forman, Jr
R A Forsaith
F Fortess
G L Frasier
H P Freigruber
H Halvorson
R H Harris
F E Hempel
C R Humphreys
W Kling
F J Knight
W J Laferriere
E F Landau
S S Levine
J H Lowe
H J Mack
J M Mecco
R L Miller, Jr
M Y Moore
J W Morton
F L Moses
R J Myers
M Nakamoto
K I Narasimhan
C W Nichols
H W O'Briant
J J O'Brien
W T J Oliphant
J J Ormond
L J O'Neill
W H Page
G R Parkin
C A Passaro
H Peers
F J Pilpel
J E Polito
A W Powell
E Purcell
G W Ray
J P Redston
A R Robbins
T F Robbins
H P Rossiger
S I Rudo
T Sakanoue
J R Schenck
D C Scott
R C Sherman
A P Shutts
D H Spitzli
P B Stam
J G Storck
A A Stulce
R L Stutz
P S Syznal
H E Talbot
J A Titri
J E Torbet
C C Urquhart
S J V'Soske
T C V'Soske
H S Weisz
H L Welsted, Jr
R C West
E L Youse
E R Zinkernagel

Junior

R N Armour
R M Bateman
N C Brackett
B Dalenoord
R H Forster
E M Haddad
E H Hartgrove, Jr
T F Healy
B H Hipps
F J Iuliano
R H Jewell, Jr
V C Lopez
F S Lutten
R Y Meredith
C S Na
D K Ratcliffe
E E St Louis, Jr
E A Schlirf
R K Shaughnessy
G C Smith, Jr
J J Weiss

Associate

A S Aloia
T A Bankmann
F J Banning
F E Bemis
W C Boliver
E C Bratt
F J Chwalek
B Grodman
A Harhalakis
D S Holt
H A Jacob, Jr
M M Jenkins
A R King
E King
D R Koya
S H Kristjansson
T B Lefferdink
D S Linz
H M Martin
S H Newland
S Ogata
J E Otto
M Palumbo
R G Perriello
J P Phaneuf
V V Polisaitis
E W Prosser
G M Randolph
T L Reiling
A G Scapini
M Sherman

Student

G L Axon
P T Bhide
L W Fisher
E L Katz
R H LaPlante
A McLuckie
L Peloquin
M J Peters
C B Rhinehart
A K Setty
S Urowitz
W C Walter, Jr
E B Zoglio

The following were transferred from other classifications to Senior membership:

L Beck
J L Crist, Jr
I Daniels
A H DeMarco
C J Duddy
P S Durfee
J B Egee
A E Johnson
G J Keppler
J F Kneeland
J B Koller, Jr
J C Lehr
E T McElwain
J Z McNab
A E Medas
N J Miller
J W Moore
P J Pernice
M L Segal
D W Snyder
R F Strauss
C Young

Respectfully submitted,
H C CHAPIN, *Secretary.*

Annual Meeting Report Pacific Northwest Section

November 20, 1951
Aero Club, Portland, Oregon

THE Annual Meeting of the Pacific Northwest Section was held at the Aero Club, Portland, Oregon, on November 20, 1951, with twenty-eight members attending.

The following officers were elected to serve for the year 1952.

Chairman—Otto E Schmidt
Vice Chairman—E J Stephen
Secretary—R M True
Treasurer—Wm C Marshall
Councilor—Charles K Bishop

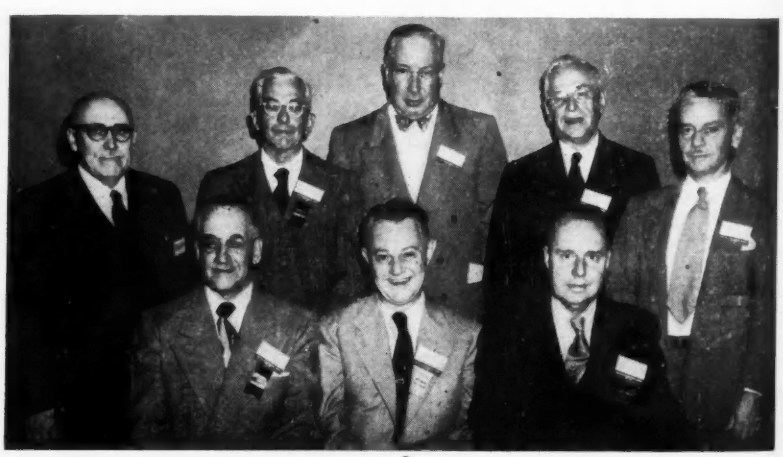
Charles K Bishop, Washougal Woolen Mills and E B O Lindquist, Geigy Co, addressed the group on their impressions of the National Convention. Plans for future meetings were discussed.

A color film on the history of the du Pont Company was shown through the courtesy of John Ayres.

Respectfully submitted,
R M TRUE, *Secretary*

EMPLOYMENT REGISTER

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the Secretary.



1951 NATIONAL OFFICERS, AATCC

Seated (l to r): George O Linberg, vice president; C Norris Rabold, president; J Robert Bonnar, vice president. Standing (l to r): Leonard S Little, chairman, Executive Committee on Research, and chairman, General Research Committee; Dr Harold C Chapin, secretary; Albert E Sampson, assistant treasurer; William R Moorhouse, treasurer; and Dr Harold W Stiegler, director of research.

Rhode Island Section Meeting Reports

October 26, 1951
Providence Engineering Society Hall
Providence, R I

AT A MEETING of the Rhode Island Section in the auditorium of the Providence Engineering Society on Friday evening, October 26, 1951, the speakers were Raymond Mace, technical director of the Crown Division, Crown Manufacturing Co, on "The Manufacture and Control of Wool-Synthetic Blends and Synthetic Blends", and Dr W George Parks of the Universi y of Rhode Island, presenting the Section's Intersectional Contest paper on "The Continuous Dyeing of Synthetic Fibers". The Nominating Committee presented its nominations for officers in the year 1952.

November 16, 1951
Sheraton-Biltmore Hotel, Providence, R I

AT A MEETING of the Section in the Sheraton-Biltmore Hotel, Providence, R I, on Friday evening, Nov 16, 1951, the speaker was Sumner H Williams, Southern manager of the General Dyestuff Corporation, on "Continuous Fiber Dyeing".

Officers for the year 1952 were elected as follows:

Chairman—Ernest J Chornyei
Vice Chairman—Eric O Appletofft
Treasurer—J William Timperley
Secretary—Robert G Thomas
Sectional Committee—Arthur F Bailey, Richard H Lewis, Douglas Martland, Bernard F Rivers
Councilor—Elliot Broadbent

Respectfully submitted,
ROBERT G THOMAS, *Secretary*

(Photos of the November 16 Meeting Appear on Page P870)

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Report of New York Section Meeting

November 30, 1951
Kohler's Swiss Chalet, Rochelle Park, New Jersey

A meeting of the New York Section was held on Friday evening, November 30, 1951 at Kohler's Swiss Chalet, Rochelle Park, New Jersey. A social hour and dinner preceded the meeting.

The Chairman, Paul J Luck, thanked the members for making the 30th National Convention the biggest success in Association history. It was voted to return to the National Association the amount collected per member in accordance with Association policy. This was the first time that the New York Section had availed itself of this privilege and had done so only because of Convention necessity.

The Chairman read a letter of invitation from the Student Chapter at Fairleigh Dickinson College to hold a meeting at the College. The Section voted to accept this invitation and it is planned to hold a meeting there in March, 1952.

Ernest J Gsell, Outing Chairman, reported on expenditures for the past outing and stated that the next outing would be held at the North Jersey Country Club on June 20, 1952.

Patrick J Kennedy, Chairman of the Nominating Committee, nominated Charles W Dorn and Weldon G Helmus for Councilors and they were unanimously elected.

The speaker was Donald E Marnon of General Dyestuff Corporation who discussed the Marhen Process. Participating in the discussion following was John H Hennessey also of General Dyestuff and co-inventor, with Mr Marnon, of the Marhen Process.

The attendance was approximately 175.

Respectfully submitted,
NORMAN A JOHNSON, *Secretary*

Report of Annual Meeting—NNE Section

November 30, 1951
Hotel Vendome, Boston, Mass

THE annual meetin,; for the election of officers was held by the Northern New England Section on Friday, November 30, 1951, in the Solarium Room, Hotel Vendome, Boston, Mass.

At the business session, the following were nominated and elected:

Chairman—C Wendall Lever
Vice Chairman—Ernest R Kaswell
Treasurer—William W Pennock
Secretary—Azel W Mack
Councilors—Edward B Bell, John M Gould, Frank J O'Neil
Sectional Committee—Robert G Fiddes, Robert D Robinson, William E Schmottlach, John H Skinkle

At the technical session, a talk on the subject "Process Water Treatment for Textile Mills" was delivered by A W Benoit, director and senior textile engineer, Chas T Main, Inc (Boston) and Stewart H Newland, district manager, Wallace & Tiernan Co, Inc (Boston).

Program, 21st Annual Meeting, ISCC

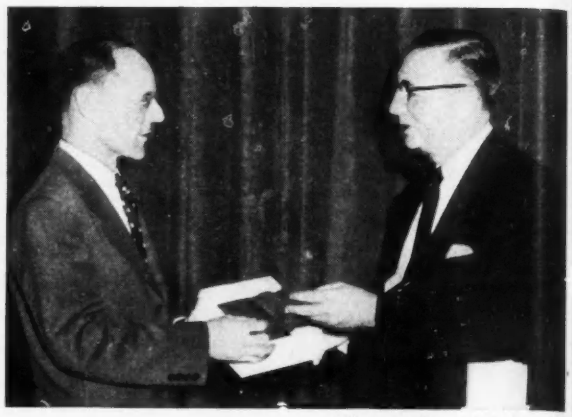
THE provisional program for the 21st Annual Meeting of the Inter-Society Color Council, which will be held February 7-9, 1952 at the Hotel Statler, New York, N Y, has been announced as follows:

Date	*Time*	*Speaker*	*Subject*
February 7	AM	Dr E I Stearns	Introduction
		Procter Thomson	"Color of Oils"
		Faber Birren	"The Functional Approach to Color"
		Dr Arthur C Hardy	"Color Reproduction"
		Dr Peter C Goldmark	"Color in Color Television"
	PM	Dr Deane B Judd	"CIE Meeting in Stockholm"
		Dr W D Wright	"Seeing Color Differences"
		(Dr Wright is Professor of Physics at the Imperial College of Science and Technology, London, England)	
		Ralph M Evans	"Color in Color Photography"
February 8	AM	Dr Harry Helson	"Color Appearance"
		Kenneth C Welch	"Color in Merchandising"
		A H King	"Abstract Movies"
	PM	Gladys Miller	"Right Color-Wrong Answer"
		Dr E I Stearns	"Color in Textiles"
		Dr Martin Fischer	"Artists and Their Colors"
	Eve	Dr I A Balinkin	"Color Phenomena"
February 9	AM	Business Session, including:	
		Reports of technical committees on color problems	
		Reports from 21 Member Bodies summarizing 1951 color activities	

MEMBERS OF THE AATCC ARE CORDIALLY INVITED TO ATTEND ALL FUNCTIONS OF THE MEETING.

(Photo by Kenneth C Everett)

Rhode Island Section Officers for 1952 (L to r): E J Chornyei, chairman; R G Thomas, secretary; J W Timperley, treasurer; and E O Appletofft, vice chairman.



(Photo by Kenneth C Everett)

Sumner H Williams Demonstrates the Results of a New Dyeing Technique to Rhode Island Chairman Peter Kolupaev.

(Photos by John E Trezise)

General Photographs
November 16th Meeting—Rhode Island Section

Calendar of Future Meetings

COUNCIL: Jan 18, 1952; April 18, 1952; June 20, 1952; Sept 19, 1952 (all in New York): Nov 6, 1952 (Boston).

GENERAL RESEARCH COMMITTEE: Dates and sites are the same as the Council's.

NATIONAL CONVENTIONS: 1952—November 6-8, Boston, Mass; 1953—Sept 17-19, Hotel Stevens, Chicago, Ill; 1954—Atlanta, Ga.

HUDSON-MOHAWK SECTION: Feb 1, 1952, Mar 21, 1952, May 2, 1952 (all at Jack's Restaurant): June 20, 1952 (Annual Outing).

NEW YORK SECTION: Jan 11 (Hotel New Yorker); Feb 29 (Hotel McAlpin, New York); April 18 (Swiss Chalet); May 16 (Swiss Chalet); June 20 (Outing).

NORTHERN NEW ENGLAND SECTION: Jan 25 (Boston); Mar 7 (MIT); April 18 (LTI); May 16 (Andover Country Club); June 6 (Annual Outing, Merrimack Valley Country Club); Dec 6 (1952 Annual Meeting, LTI).

PACIFIC SOUTHWEST SECTION: Jan 11, 1952 (Nikabob Cafe, Los Angeles); March 28, 1952.

PHILADELPHIA SECTION: Jan 18 (Kugler's, Philadelphia); March 7 (Penn-Sheraton Hotel, Philadelphia); April 25 (Abraham Lincoln Hotel, Reading, Pa); June 13 (Outing, Lu Lu Temple Country Club, North Hills, Pa).

PIEDMONT SECTION: Feb 1-2 (Robt E Lee Hotel, Winston-Salem, N C; April 25-26 (Clemson House, Clemson, S C); June 6-7 (Ocean Forest Hotel, Myrtle Beach, S C); Sept 12-13 (Hotel Charlotte, Charlotte, N C).

ABSTRACTS

Microscopical Dyeing Phenomena; Studies with the Microdyeoscope

H E Millson and L H Turl, *Textile Research J* 21, 685-702, October, 1951.

Many investigations of the mechanism of dyeing have been described in the literature. In addition to contributing a vast amount of knowledge to the field, these studies have also revealed the desirability of an experimental study on a microscopic level of the changes taking place in both the fiber and the dye bath during the dyeing cycle.

The present authors have developed an instrument, called the "Microdyeoscope," which permits both visual and photographic observation of dyeing phenomena approximating conditions encountered in the usual commercial dyeing processes. This instrument and several dyeing studies carried out with its aid are described in detail in this paper.

The essential merit of the Microdyeoscope is that it permits the continuous observation of microscopic phenomena associated with the dyeing of textile fibers under controlled conditions simulating those found in normal dyeing practice. This is accomplished by means of the circulation of a normal dyebath through a cell designed to permit microscopic observation of fibers mounted within it and forming part of the dye-bath/fiber system. A standard microscope is employed with a specially modified mechanical stage to carry the cell and to permit continuous observation of the process under study.

The dyeing chamber, which serves to establish the dye-bath conditions and to permit macro-experimental control of the dyeing, is a glass cylinder approximately 50 mm in diameter with a volume capacity of 330 ml.

The cell in which the fibers are mounted for microscopic observation is a stainless steel cylinder with glass windows, the observation window being a microscope slide cover glass. The fibers, wound on U-shaped wires, are held rigidly against the inner face of this window, and are easily within range of the conventional microscope objectives.

The Microdyeoscope, in addition to providing means for control of all factors believed important in the dyeing process, permits examination of the same fiber or fibers at all stages of the operation, including wet processes either preceding or following the dyeing cycle. The progress of dyeing can be followed, and the changes occurring at any given point on a fiber may be studied while the sorption of dye proceeds. The progress of other wet processes, such as scouring, bleaching, stripping and chlorination, can also be observed continuously under closely controlled conditions.—WHC

Gluconic Acid—Versatile Agent for the Textile Chemist

J P Bilello, *Textile World* 101, 151, 286, 288, 338-40, October, 1951.

Gluconic acid, because of its nontoxic, nontendering, noncorrosive nature, is finding new uses in the textile industry and has properties likely to widen its usage. It is one of the mildest of commercially available nonvolatile organic acids. Chemically speaking, it is 1,2,3,4,5-pentahydroxycaproic acid, and is produced by a fermentative oxidation of glucose. The acid of commerce is a 50 per cent aqueous solution.

The anhydride of gluconic acid, glucono delta lactone, is also commercially available as a white, odorless crystalline powder. It is easily soluble in water and hydrolyzes to form odorless, colorless solutions of gluconic acid.

Of the more common commercially-available nonvolatile organic acids, gluconic acid exhibits the lowest rate of corrosion. Fabrics impregnated with concentrations as high as 10 per cent acid, subjected to accelerated aging treatment, and tested by conventional tensile strength tests were shown to be not tendered by it. It is also stable and nonvolatile, and as a result, does not produce the irritating vapors commonly encountered with acids (such as acetic and formic) in dyeing and printing operations.

The pH of a 2 per cent solution of gluconic acid is 2.40, slightly lower than acetic acid of the same concentration.

An additional property of the gluconates, important in textile applications, is their sequestering action. Gluconic acid, like most hydroxy- organic acids, is capable of forming water-soluble complexes with metallic ions, such as iron, aluminum and copper. It is also efficient in sequestering iron, calcium and magnesium in mercerizing liquors.

Aluminum sulfate is used to impart water-repellent properties to the fabric. It is often desirable to use basic aluminum solutions, in which case the addition of slight amounts of gluconic acid may be used to hold the aluminum in solution.

In printing the leucoesters of vat dyes, ammonium gluconate may be added to the printing paste as an acid catalyst. On steaming, the gluconate decomposes to yield a nonvolatile, nontendering acid medium in which to develop the color.

The use of synthetic resins for finishing textiles has become increasingly important during the last several years. Fabrics treated by the recently developed acid-colloid resins method have shown a considerably higher retention of tensile strength than is obtained from the urea-formaldehyde treatment of textiles. The necessity for an acid catalyst led to an investigation of the various mild organic acids conventionally used by the textile industry for this purpose. As a result of this work, the use of glucono delta lactone as the acid catalyst for acid-colloid resins has gained wide acceptance. Since this material is colorless, nontendering, and does not give offensive odors, there is no need for an after-wash of the fabric.—WHC

Polyvinyl Alcohols and Their Use in Textile Processing.

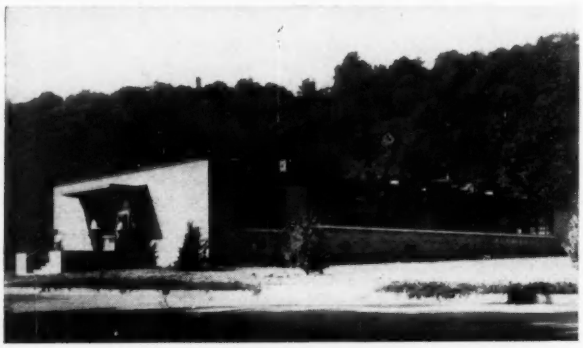
J S Trevor, *Textile Recorder* 69, 99, August, 1951.

Polyvinyl alcohols are of importance in the textile industry, not only as auxiliaries for use in such processes as sizing, finishing, and emulsifying, etc, and for the production of synthetic fibers, but for making protective clothing, diaphragms, hose, sewing laces and driving belts, the last named, in particular, being used extensively in textile mills in Germany during the last war because of their inability to develop static electrical charges.

The properties of polyvinyl alcohols of most interest to textile manufacturers as sizing and finishing agents may be summarized in four groups. In the first place, aqueous solutions are stable over prolonged periods. Secondly, evaporated films are exceedingly tough, colorless, unaffected by most organic solvents, and possess a high degree of impermeability to gases and air. Thirdly, deposited films are sufficiently elastic not to crack and split off from yarns which tend to stretch. Finally, polyvinyl alcohols are able to improve the handle of viscose rayon and spun rayon fabrics which have been treated with urea-formaldehyde resins, melamine-formaldehyde resins, or formaldehyde. By means of these alcohols it is possible to reduce harshness and to provide a full, superior handle.

The value of polyvinyl alcohol as a fiber-forming resin is difficult to assess, as very little of the fiber has so far become available for appraisal. The Japanese polyvinyl alcohol fiber, known as Vinylon, is claimed to have a full handle and to be warm to the touch. It can be crimped and given other standard textile finishes.—WHC

NEWS



A View of the New Stauffer Chemical Company Laboratory at Chauncey, N Y.

A view of the Expanded Hilton-Davis Dye Laboratory.

• Stauffer Opens New Chauncey, N Y, Laboratory

J F Crowther, director of the Eastern Research Division, Stauffer Chemical Company, has announced the opening of a new laboratory adjacent to the Stauffer Plant at Chauncey, N Y, where additional facilities for pilot plant work are maintained. Dr J T Bashour will be in charge. Construction on the 16-room laboratory was started in July, 1950 and all facilities, including parking area and landscaping, were recently completed.

• Deep Brilliant Shades In Packaged Dyed Orlon

Package dyeing of a new line of heavy brilliant shades in filament and spun Orlon has been announced by Central Yarn and Dyeing Company, Gastonia, N C.

The new colors were developed by the company's dye research laboratory primarily for high style effects in full fashioned hosiery, but may also have application in the half hose and suitings fields, according to company officials.

It was stated that the new shades of Orlon have successfully retained the brilliance of the original dyeing after the hosiery or fabric is piece dyed, and that full cross-dyed effects were obtained where the dyed Orlon was used in connection with cotton, wool, or other synthetic yarns. Company officials claim good reception of the new colors, which, are said to be generally heavier and brighter than the shades previously obtainable in packaged-dyed Orlon.

The new colors include deep brilliant shades of chartreuse, fuchsia, green and purple, all reportedly fast to cross-dyeing, boiling, and preboarding at 270°F, and of good light fastness.

Company officials have stated that the new shades were developed during research on package dyeing other synthetic yarns, including filament and spun rayon, nylon, and Dacron.

• Hilton-Davis Doubles Size of Dye Lab

James F Thompson, general manager of the Hilton-Davis Chemical Company, Cincinnati, has announced the completion of construction for a new wing to the company's dyestuff laboratory and the installation of new equipment, featuring the latest models of testing apparatus, e g, the Fade-Ometer, and additional print and padding machines.

The addition doubles the size of the laboratory, increasing facilities for standardization of the Company's line of dyestuffs and for special customer services. The laboratory was constructed 2 years ago.

Included in the expansion is a new glass-top weigh-up room for preparing samples of dyes, which has been separated from the rest of the laboratory to prevent contamination of the air in other units.

COMING EVENTS

AMERICAN SOCIETY FOR TESTING MATERIALS

Spring Meeting and Committee Week, March 3-7, 1952, Cleveland, Ohio.

Annual Meeting, June 23-27, 1952, New York N Y. (The biennial Apparatus and Photographic Exhibits will be held in conjunction with this meeting).

1953—Spring Meeting (Hotel Statler, Detroit, Mich.)

Annual Meeting (Chalfonte-Haddon Hall, Atlantic City, N J.)

1954—Spring Meeting (Shoreham Hotel, Washington, D C)

Annual Meeting (Sherman Hotel, Chicago, Ill.)

FIBER SOCIETY

Meeting: April 16-17, 1952 (Clemson House, Clemson, S C.)

NATIONAL ASSOCIATION OF TEXTILE MACHINERY MANUFACTURERS

Exhibit of American Textile Machinery, April 26-May 1, 1954, Atlantic City Exhibition Hall, Atlantc City, N J.

NEW YORK BOARD OF TRADE

26th Annual Dinner of the Drug, Chemical and Allied Trades: March 6, 1952.

26th Annual Meeting: September 25-28, Pocono Manor Inn, Pocono Manor, Pa.

SOCIETY OF PLASTIC ENGINEERS, INC.

January 16-18, Edgewater Beach Hotel, Chicago, Ill.

• Finishing Advisory Group OK's Sulfuric Acid Limitation

In their first meeting with the National Production Authority last month, the Textile Finishing Industry Advisory Committee (which does not include wool finishers) advised that it would not offer objection to an order imposing a 90% limitation on the use of sulfuric acid for textile finishing.

Industry representatives agreed that some restrictions on the use of sulfuric acid might be required as a result of the world sulfur shortage, but pointed out that if textile production and demand improve, a 90 percent rate of use would be insufficient. The textile finishing industry reportedly uses less than one percent of total U S production of sulfuric acid.

NPA officials told the committee that the supply outlook for dyestuffs and other chemicals used in cloth finishing appeared favorable. Plant expansion programs now under way should assure supplies of vat colors adequate for civilian needs and known military requirements, they pointed out, and there is no shortage of direct colors or intermediate materials for dyestuffs.

To obtain better information on the industry's requirements for chemicals, particularly sulfuric acid, and other materials, NPA's Textile Division is considering making a series of surveys. Draft copies of four forms which may be used in the surveys were distributed and discussed with the committee. The committee recommended that finishers not be required to report on the end-use of materials which they process. Members explained that materials designed for one use may be adapted to a quite different purpose after finishing so that their own estimates would never represent actual end-use. It was also requested that firms be allowed to report their production on a current rather than a historical basis if the surveys are made.

Committee members included W A Broadfoot, The Aspinook Corp; W R MacIntyre, Jos Bancroft & Sons; W B Sellars, Burlington Mills Corp; Weldon G Helmus, Fair Lawn Finishing Co; John A Kane, Jr, Fashion Screen Print Co; Ralph Gutekunst, Hellwig Dyeing Corp; R B Coleman, National Dye & Finishing Corp; Emma L Conlon, Puritan Piece Dye Works; William Berry, Riegel Textile Corp; Theo Schetty, Schetty Bros, Inc; Robert D Sellers, Southern Bleachery & Print Works; and Tracy A Adams, U S Finishing Co.

In other recent meetings with industry advisory groups the NPA told the Synthetic Detergents Industry Advisory Committee that "the loss of Iranian oil imports to the U S could mean a significant cutback in synthetic detergent production" and advised the Textile Machinery Industry Advisory Committee that the manufacture of textile machinery would be reduced to about its 1947 production level (approximately 45% less than the 1951 rate of output).

NPA explained that if Iran's petroleum products are lost, benzene will have to be diverted to the nation's aviation gasoline production program. However, NPA gave assurances that continued domestic production of benzene at present levels, plus benzene imports, will be adequate to meet the 1952 needs of detergent manufacturers, if there is no loss of Iranian petroleum products, which constitute almost 40 percent of such imports. NPA also stated that there is every indication at present that supplies of sodium phosphates will be adequate in 1952.

Members of the Synthetic Detergents Industry Advisory Committee included M A Conner, Allied Chemical & Dye Corp; H W Zussman, Alrose Chemical Co; Kenneth E Mulford, Atlas Powder Co; James A Reilly, Colgate-Palmolive-Peet Co; Dr Ray Mayhew, General Aniline & Film Corp; J O Brownell, Lever Bros Co; W R Corey, Monsanto Chemical Co; F L Jones, Nopco Chemical Co; Richard Dexheimer, Onyx Oil & Chemical Co; H E Branston-Cook, Oronite Chemical Co; T J Wood, Proctor & Gamble Co; A C Stoneman, Purex Corp Limited; A C Stepan, Jr; Stepan Chemical Co; Harry Theobald, Theobald Industries; and Fred H Buck, Jr, Ultra Chemical Works. The committee recommended that in the promulgation of any sulfur restriction the following points be considered:

1. That the order be on a company-wide limitation basis, rather than a plant-by-plant basis.
2. That allotments be made on an annual usage basis, broken down by quarters, with a carry-over privilege from one quarter to the next.

Members of the Textile Machinery Advisory Committee recommended that the basis for determining allotments of controlled materials to textile machinery manufacturers be reviewed and consideration be given to upward revision of allocations. They pointed out that about 40% of present produciton is for maintenance and repairs, leaving only 10-15% of the facilities available for new building, and warned that a sharp cut in production would mean a larger amount of foreign machinery being sold in the U S.

Among the members of the Textile Machinery Advisory Committee were: John P Franklin, David Gessner Co; Bliss M Jones, Rodney Hunt Machine Co; James H Hunter, James Hunter Machine Co; D A Colker, National Drying Machinery Co; and D L Friday, Cocker Machine & Foundry Co.

• Dow Opens New Caustic Terminal

The Dow Chemical Company has reinforced its position in the growing Southern California market by opening a Los Angeles Harbor Terminal for storage of 50 percent concentrate caustic soda solution.

The firm produces caustic soda solution at its Pittsburg, California plant, near San Francisco, and heretofore has supplied the Southern California-Arizona market by railroad tank car in 8,000-gallon lots.

The new facility, which was officially opened November 29, reportedly will enable Dow to supply tank truck loads of 3,000, 2,000 and 1,500-gallon capacity as well as tank car shipments. Large quantities of caustic soda solution will be brought to Los Angeles harbor from the northern California plant by tanker, it is reported.

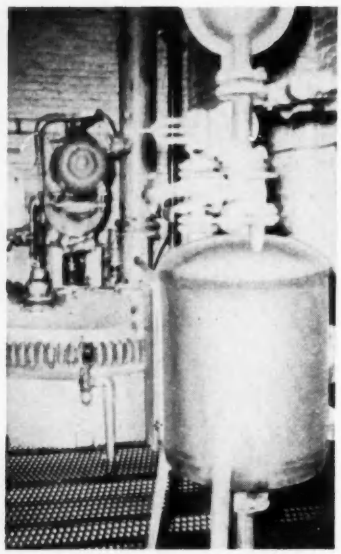
• P & G Subsidiary Contracts for Florida Site

A contract for the purchase of 440,000 acres of pine land in northwestern Florida was recently signed by the Buckeye Cellulose Corporation, a wholly-owned subsidiary of Procter & Gamble, it is learned. The property reportedly will be used by the company to expand capacity for the production of its cellulose pulp, the demand for which can no longer be met fully by the company's plant in Memphis, Tennessee. Purchased from Brooks-Scanlon, Inc, the property is located near Foley, Florida, approximately 15 miles from the Gulf of Mexico. The purchase price of the property was not announced.

Buckeye plans to construct a plant for the production of dissolving pulp from wood on the land purchased and from the surrounding territory. The exact site has not yet been selected.

• Dr Wade to Address American Section, SCI

Dr Worth Wade, American Viscose Company executive and president of the American Section of the Societe de Chemie Industrielle, will address the Section at the January meeting, which will take place at the French Embassy Cultural Office, 934 Fifth Ave, New York, N Y. His topic will be "Latest Developments of the Chemical Industry in France and Europe".



Amalgamated Reactor

• New Step in Amalgamated Expansion Completed

Another step in the far-reaching expansion program of the Amalgamated Chemical Corporation, Philadelphia, was recently completed, the chief feature of which is a 750-gallon glass-lined reactor equipped with condensers and receivers for operation under vacuum. Automatic controls, including a 3-stage vacuum steam jet, are designed to insure operation at proper reaction temperatures. A new, fully-automatic steam generating plant controls its independent operation.

Other features of the $50,000 program reportedly include an enlarged research and consulting service department, air-conditioned offices and increased capacity for synthesizing chemicals.

Harold B Dohner, president, points out that the company's production capacity is at its highest peak since its founding in 1939.

• ITT Reports New Source of Tar Spots

The Institute of Textile Technology, Charlottesville, Va, has revealed a new source of "tar spots" in cloth that cause small blemishes in fabric, forcing classifications of "seconds" or necessitating special cleaning treatments.

Dr Jack Compton, ITT technical director, reports that while a large number of the spots are caused by asphaltic materials, it has been proven that many come from resin sacs normally present in leaves or burrs which become mixed with cotton fiber during harvesting. The discovery is attributed to Leo Hubbard, ITT research chemist.

It is pointed out that these tiny egg-like capsules, about one-fiftieth of an inch in size, can often be spun right into a piece of yarn and woven into the cloth. When heated, they burst and a black substance resembling tar flows out to cause a smudge. It is stated that ordinary bleaching operations cannot remove the stain, which, unlike asphalt tar spots, will not dissolve in petroleum solvents.

Mr Hubbard's discovery marks the first time in the history of cotton culture and manufacturing that science has traced "tar spots" trouble to vegetable resin sacs, Dr Compton states, and opens a new way toward eliminating the problem.

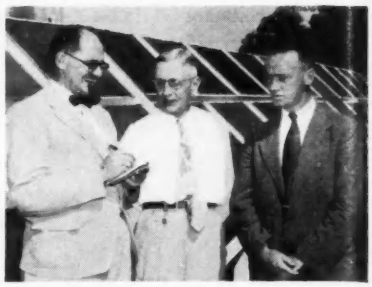
• Stock-Dyeing Method for Dynel-Wool Blend Revealed

A specific method for stock-dyeing the dynel to be used in the 15% dynel-85% wool blend, authorized in new specifications for Marine Corps green kersey, has been developed by Carbide and Carbon Chemicals Company. Details of the new method, which employs the "copper drip" technique, indicate that it is practical for immediate use in commercial equipment, according to T A Feild, Jr, who has been in charge of the development at Carbide's laboratories in South Charleston, W Va. Development of the technique was reportedly stimulated by the issuance on November 1 of Inv 145-S for 672,200 yards of green kersey cloth for the Marine Corps Supply Depot, Philadelphia.

The procedure is said to consist of five successive steps in the dyebath: preliminary dyeing, the "drip" period, resumption of dyeing, relustering with sodium sulfate, and rinsing and scouring. Total dyeing time from loading to unloading is estimated at five hours. Estimated total cost of all dyes, assistants, wetting agents and scouring materials is from 23 to 25 cents per pound of stock.

Mr Feild has stressed that proper heating and rate of liquor circulation are vitally important in using the new technique on the dynel-wool kersey blend. Some rearrangement of location of heating coils may be necessary in certain types of equipment, he points out, preferably in the surge tank rather than in the dye kettle, except when open tubs are used. To control the flow of liquor, either hand throttle valves or orifice plates are said to be desirable. It was stated that liquor circulation should approximate one gallon per minute per pound of fiber, resulting in a pressure drop across the stock of ten pounds per square inch. It was also recommended that machine cover plates be of a type that prevent cake shifting.

The new procedure reportedly employs 2.25% du Pont Anthraquinone Blue SWF 150%; 4.5% Eastman Fast Yellow 4RLF, and 0.90% Eastman Fast Red GLF to obtain the desired shade of green. Fastness studies are currently being made.



Dr H R Ambler (left), superintendent, British Ministry of Supply, Tropical Testing Establishment, Nigeria, takes notes on the outdoor exposure tests of cotton fabrics conducted by the U S Department of Agriculture in New Orleans during a visit to the Southern Regional Research Laboratory recently. He is aided by J D Dean (center), head of the Cotton Chemical Processing Division, SRRL. Dr L Phillips (right) is with the Chemical Research and Development Section, British Joint Services Mission, Washington, D C.

The Laboratory is cooperating with the Quartermaster Corps in extensive tests to discover better ways of protecting cotton fabrics under various climatic conditions throughout the world, particularly in tropical and subtropical areas where damage from rot and mildew is a serious problem.

• Millmaster Chemical Changes Name

The name of Millmaster Chemical Corporation was changed on November 15 to Berkshire Chemicals, Inc. The offices of the company remain at their present location in the Graybar Building, 420 Lexington Avenue, New York 17, N Y.

Berkshire Chemicals, Inc will continue to act as exclusive sales agents for F W Berk & Co, Inc.

• DCAT Changes Annual Meeting Site

The 62nd Annual Meeting of the Drug, Chemical and Allied Trades Section, New York Board of Trade, Inc, will be held September 25-28, 1952 at Pocono Manor Inn, Pocono Manor, Pa. According to Charles M Macauley, DCAT chairman, growing attendance at the Meetings has neccesitated the change from Shawnee Inn, where they have been held for the past 5 years.

DCAT committee heads for the '51-'52 fiscal year includes: *Arbitration*—Ralph A Clark, *Auditing*—S F Urban, *Bulletin*—Stanley I Clark, *Coordination*—Carle M Bigelow, *Finance*—Hugh S Crosson, *Legislative*—James G Flanagan, *Tariff*—Fred G Singer, *Membership*—Claude A Hanford, *Membership Maintenance*—J David Hayden, *Publicity*—Murray Breese, *Public Relations*—George S McMillan, *Section Activities*—Lloyd I Volckening.

• "Antara Products" Becomes "Antara Chemicals"

Antara Products, a division of General Dyestuff Corporation, 435 Hudson Street, New York 14, N Y, in furtherance of a $20 million expansion program in the field of surfactants, intermediates, acetylene chemicals and allied products, is to be known as Antara Chemicals in the future, according to an announcement by John C Franklin, executive vice president of GDC.

Antara, which coordinates and handles the sales and services of all acetylene chemicals, intermediates and allied products made by General Aniline & Film Corporation, was formed October 1, 1950, as a merger between the original Antara Products, then a division of GAF, and the Organic Chemicals Division of GDC.

According to Mr Franklin, the change of name to Antara Chemicals, division of General Dyestuff Corporation, more accurately characterizes the general product line of GAF, sold by Antara.

• 3-Fold Plan to Aid European Productivity Outlined

A three-fold long-range plan to "increase Western European productivity and assure survival of free enterprise in Europe" was outlined by Herbert L Werner, head of Werner Textile Consultants and P O M Company-Industrial Consultants before 41 top Western European textile industrialists at the St Moritz Hotel in New York last month. Part of a two-week program planned by the Economic Cooperation Administration and the National Association of Manufacturers, the session represented the first International Textile Management Conference, and was attended by textile industrialists from 16 Western European countries.

Mr Werner's three-fold plan urged European industrialists to: (1) change their mental attitudes toward employees, markets and business practices in general; (2) place greater stress on human relations in all aspects of their business activities; and (3) make special efforts to inculcate in their young people such American principles as the dignity of the individual, equality of opportunity, the importance of self-reliance and understanding rather than fear of authority.

Informal exchange of ideas on modern management methods highlighted the conference. Participating with Mr Werner in the symposium were the following members of the Werner-P O M staff: Rudolph M Ashner, partner; William B Sears, chief engineer, Stephen I Rudo, research director, and Robert Borden, senior field engineer. They spoke respectively on "Management—Its Objectives and Methods"; "Machinery—Its Utilization By Management"; "Materials—Selecting and Testing of Natural and Artificial Fibers"; "Manpower—Selection, Training and Advancement". "Modern Methods of Marketing" were covered by Kendrick J Hurley, partner of the Piedmont Southern Company.

In addition to members of the Werner organization, representatives of American textile mills and textile machinery manufacturers and the heads of other industrial and management consulting organizations took part in the discussion.

The conference was welcomed by William H Joyce, Jr, assistant administrator for production of ECA. The textile project was under the direction of Curtis Anderson, of ECA, textile project manager, assisted by four project managers—Stephen MacRae, Lee Cornell, Wallace Jeffords, Jr, and George M Powell.

• Amsco to Distribute Cyanuric Chloride for Nilok

Nilok Chemicals, Inc (Niagara Falls, N Y) has appointed the American Mineral Spirits Company (New York, N Y) as exclusive distributor in the Eastern Seaboard States for their cyanuric chloride. Amsco district offices are located in Philadelphia, Pa, Rahway, N J, New York, N Y, Providence, R I, and Boston, Mass.

Five direct descendants of the late Charles Morningstar, who in 1851 founded the parent company of Morningstar, Nicol, Inc, are shown in the New York office under the portrait of the late Joseph Morningstar, the son of the founder, and father of the present company owners.

Left to right: Captain Joe Barry Morningstar, great-grandson of the founder; Percy Morningstar, grandson, of Boston, who heads the New England office; Karl Illava of Greenwich, Conn, sculptor grandson who adopted the original Hungarian family name; Joseph Morningstar, of New York, president; and Robert Morningstar of New York, who heads the textile chemical division.

Another great-grandson, Thomas Morningstar, son of Joseph has just returned to the company after a tour of duty with the U S Navy. Richard Morningstar, son of Percy, is a radio and television actor.

• Heyden Purchases New Texas Site

Heyden Chemical Corporation has purchased sixty acres of land adjacent to the Houston Ship Channel, Houston, Texas, to be used as the site for a plant to produce methanol and other products.

• ASA Committee Approves Standards for Rayon Fabrics

The Consumer Goods Committee of the American Standards Association has recommended approval of the proposed American Standards for Rayon Fabrics at a meeting on November 27, at ASA headquarters. These standards will now be submitted to ASA's Standards Council for final disposition. The Council is the ultimate authority on approval of all standards before they can become American Standards.

• Price Schedule on Aerosol OT-B Reduced

American Cyanamid has reduced the price schedule on the recently-introduced Aerosol OT-B wetting agent by approximately 15%. The product is a concentrated quick-dissolving powder that can be shipped in nonreturnable fiber drums.

• 1952 Officers, ACCCE

The following officers have been elected to serve the Association of Consulting Chemists and Chemical Engineers, Inc for 1952:

President .....ERWIN DI CYAN
Vice President...EARL D STEWART
Secretary.....*WM C BOWDEN, JR*
Treasurer.....FOSTER D SNELL

Newly-elected Councilors (for 3 years) include Robert S Aries, Elliot A Haller, Hugo Klein, Clarence E Mange, and Robert V Siebel. Hold-over Councilors include past president Percy E Landolt, Carl Bussow, Charles Davidoff, Chester L Knowles, Harry A Kuhn, Jos H McCabe, Nicholas M Molnar, A Rooseboom, Maurice S Sage, Frank A Strauss and Lincoln T Work.

• New TRI Officers and Trustees

The newly-elected slate of officers and trustees of the Textile Research Institute follows:

President—ANDRE BLUMENTHAL, Sidney Blumenthal & Co, Inc

Vice President and *Chairman of the Executive Committee*—PERCY S HOWE, JR, American Thread Company

Treasurer—DR DONALD H POWERS, Warner-Hudnut, Co, Inc

Secretary—PAUL C ALFORD, JR, Textile Research Institute

New trustees include SYDNEY M CONE, JR, Cone Mills Corp; A G ASHCROFT, Alexander Smith, Inc; RUSSELL B NEWTON, Dan River Mills, Inc; and DR W H CHURCH, du Pont.

NAMES IN THE NEWS

Douglas C Newman

• Newman Heads Sales of duPont Organic Chemicals

All sales activities of the du Pont Company's Organic Chemicals Department were brought under one general director December 1, with DOUGLAS C NEWMAN taking over the new position. He moves up from sales director of the dyestuffs division.

On the same date, DR MILES A DAHLEN became director of sales, dyestuffs division, and GORDON M MARKLE, director of sales, fine chemicals division. H J SWEZEY has been appointed director of sales of the export division, and J PRESTON WILLS, manager of export sales. The export business of the entire department is now put in one sales division for the first time.

Miles A Dahlen

Gordon M Markle

•Prof Schwarz 2nd Harold Dewitt Smith Memorial Medal Recipient

PROFESSOR EDWARD M SCHWARZ, head of the Textile Division, Massachusetts Institute of Technology, was honored during the recent 3-day meeting of Committee D-13 (Textiles), ASTM as the second recipient of the Harold Dewitt Smith Memorial Medal. The award is endowed by Fabric Research Laboratories, Inc of Boston as a testimonial to the memory of Mr Smith, a prominent textile scientist.

• Girdler Appoints New Eastern District Manager

ELLIS T BECK is the new Eastern District Manager of the Votator Division of The Girdler Corporation, Louisville, Ky. He succeeds SAMUEL WELCH, who resigned on October 31. Announcement of Mr Beck's appointment was made by John E Slaughter, Jr, Girdler vice president.

• Lippman to Manage CEC Labs

The Commonwealth Engineering Company, Dayton, O, has appointed ALFRED LIPPMAN, JR, as general manager of its laboratories.

Mr Lippman was previously with the Bay Chemical Company, a division of Morton Salt Company, for 19 years, the last 12 of which he was manager in charge of production, research and development.

The company has also announced the appointment of DR LEO J NOVAK as chief of its Biological Laboratory Division, which has been engaged for the last fourteen years in working with Dextran and its derivatives.

Dr Novak was formerly technical director of Ethicon Suture Laboratories.

Alfred Lippman, Jr

Leo J Novak

D G Rogers

• Rogers Assumes National Aniline Presidency

The appointment of D G ROGERS to the presidency of the National Aniline Division, Allied Chemical & Dye Corporation, became effective on December 1.

Mr Rogers, executive vice-president of National Aniline since October 1950, succeeds E M MAXWELL, who for some time has been absent because of Illness.

• Burns to Receive Perkin Medal

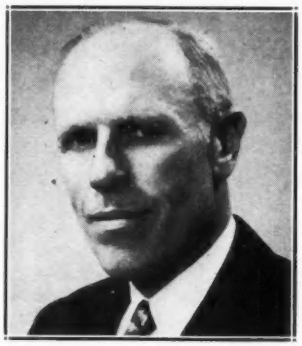
ROBERT M BURNS, chemical director of the Bell Telephone Laboratories, Murray Hill, N J, will be the 46th recipient of the Perkins Medal on January 4th at the Waldorf-Astoria, New York. The award is an outstanding honor conferred by the Society of Chemical Industry for achievement in American industrial chemistry.

• ACS Selects Chairman for 121st National Meeting

DR HANS O KAUFFMANN, director of research and development of the Buffalo Electro-Chemical Company, Inc, has been chosen general chairman of the 121st national meeting of the American Chemical Society to be held in Buffalo from March 23 to March 27, 1952, according to an announcement by George M Bramann of the Mathieson Chemical Corporation, chairman of the Society's Western New York Section.

• Holmes Upped by Stauffer

Stauffer Chemical Company has announced the appointment of ERNEST G HOLMES as sales manager, Agricultural Chemicals, Houston Sales District. Mr Holmes was formerly Manager of the Weslaco, Texas branch. The Houston sales district covers the states of Mississippi, Louisiana, Arkansas, Texas, Oklahoma, and New Mexico.



R G MacDougall

• MacDougall New General Manager of Warwick Department

ROBERT GORDON MACDOUGALL replaces the late Albert Leitstein as general manager of the Featured Fabric Finishes Department of the Warwick Chemical Company, Division of Sun Chemical Corporation.

Mr MacDougall has a background of 25 years in advertising and promotion, the last 9 of which have been with Warwick. His duties will include the promotion of textile chemical sales, with special emphasis on Impregnole and Norane water repellents.

• Alexander Smith Names Sales Engineer

EDMUND S LAMONT has been appointed sales engineer for the Products Division of Alexander Smith, Inc, according to Frank H Higgins, company vice-president and general manager of the Division.

In his new position, Mr Lamont will direct the marketing of processes and products developed by the Division, which was responsible for development of the Harristrip and Textralizing processes. He was formerly sales representative for the Merrimac Division of the Monsanto Chemical Company.

• Huber Named Cleveland Office Manager by Hercules

RICHARD L HUBER has been named manager of the Cleveland office of the Cellulose Products Department, Hercules Powder Company. The Cleveland office, previously under the supervision of the department's office in Detroit, will now function as an independent branch.

The area under Mr Huber's supervision will include Cleveland, Akron and Pittsburgh. Buffalo and Rochester will continue to be served by the Detroit office.

Mr Huber has represented Hercules in Cleveland since 1946.

R L Jones

• R L Jones Becomes Division Sales Manager for Royce

RICHARD L JONES has been appointed sales manager of the Textile Division, Royce Chemical Co, Carlton Hill, N J, climaxing a career of selling in the Pennsylvania territory that began in 1935.

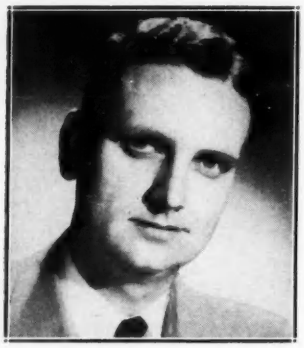
• Stenstrom Named Sales Manager of CCA Affiliate

JAMES A STENSTROM has been named sales manager of Canadian Chemical Company Ltd, which is now erecting a large petrochemical plant on a 430-acre site at Edmonton, Alberta. The sales office of the company will be in Montreal, and a selling organization is now being established for the distribution of the plant's output in Canada, the United States and other markets.

• Guernsey to Direct Kamen Soap Sales

Kamen Soap Products, Inc, New York, N Y, has announced the appointment of F H GUERNSEY as director of sales. Mr Guernsey, who was formerly with E F Drew & Co, Inc and the Cowles Chemical Co, will direct a nation-wide program for marketing the company's line of soaps, synthetic detergents, distilled fatty acids, stearic acid, red oil, hydrogenated oils, sulfonated oils, etc.

F H Guernsey



Robert E Smith

• Smith to Head Acrilan Sales

ROBERT E SMITH, former assistant manager of the Staple Sales Division, American Viscose Corporation, has been appointed Acrilan sales manager for the Chemstrand Corporation. Mr Smith has been assisitng in experimental work on the new acrylic fiber for the past several months. He began his association with American Viscose in 1940.

• Brubaker Joins Witco

HARRY M BRUBAKER has been appointed assistant sales manager of the Carbon Black Division of Witco Chemical Company. He will occupy offices at 311 Evans Building in Akron, Ohio.

Before joining Witco, Mr Brubaker was with B F Goodrich's Hycar Division, the Phillips Chemical Company, and the Sid Richardson Carbon Company.

• R H Funke, Jr Commissioned in USCG

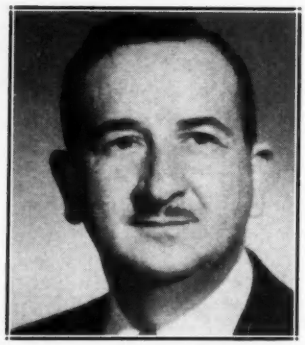
RUDOLPH HERMAN FUNKE, JR was among a group of 78 men who were commissioned on November 21st with the rank of Ensign, U S Coast Guard Reserve, following a successful completion of an extensive 4-month course at the U S Coast Guard Academy.

Ensign Funke, a graduate of Philadelphia Textile Institute and an AATCC member, is serving on the cutter Mariposa, which operates from Staten Island, N Y.

• Cloney Assumes New Antara Post

JAMES M CLONEY has been appointed product manager for surfactants and related chemical products of Antara Chemicals, a division of General Dyestuff Corporation.

Mr Cloney formerly handled sales of all Antara products on the West Coast, with headquarters in San Francisco. He joined Antara in 1946 as a field salesman, working out of the New York office.



Philip Swartz

• Dexter Appoints Pennsylvania Service Representative

PHILIP SWARTZ was recently named Pennsylvania sales and service representative for the Dexter Chemical Corporation. He has been active in textile fields for over 25 years, most recently in chemical sales.

Mr Swartz has been working closely with the problem of electrostatics on textiles, and will be introducing Dextrol Lekrostat B, the new Dexter antistatic agent, to Pennsylvania throwsters, weavers, dyers and finishers of acetate, viscose rayons, nylon and the newer synthetics.

Walter E Wenck

• Wenck Joins Emkay

WALTER E WENCK has joined the sales staff of the Emkay Chemical Company and will operate from Gastonia, N C to sell and service Emkay's line in the Carolinas and Tennessee. Mr Wenck in recent years has been a dyer at Patrician Dye Works in Columbia, Pa and Clifton, N J. Previously, he obtained considerable dyeing experience in Canada and Mexico.

• Putnam Appointed to ACC Post

BORDON R PUTNAM, JR has been appointed Supervisor of Market Research in the New Product Development Department of American Cyanamid Company.

OBITUARY

J REESE DANIEL

J REESE DANIEL died suddenly in the Henry Grady Hotel, Atlanta, Ga, on October 12th at the age of 49.

Born in Dawson, Ga, Mr Daniel attended elementary schools there, and later, Lanier High School in Macon. He came to Charlotte, N C, in 1920 and studied at Brown's Business College. His entrance into the dyestuff business came in 1926 with General Dyestuff Corporation, where he remained until 1943 as a member of the office staff and later in the sales department of the Southern office. He was with the Calco Chemical Division from 1943 to 1944 at which time he joined the sales staff of the National Aniline and Chemical Co in Charlotte, where he remained until the time of his death.

Mr Daniel, son of the late J M Daniel, is survived by his wife, son and mother. He was a member of the Masonic Order of Sanford, N C.

Funeral services were held in Charlotte. Burial was in Greenville, S C, where he made his home for the greater part of his business career.

CHARLES D POTTER

CHARLES D POTTER, Southern Manager for the E J Feeley Company of Boston for the past 15 years, died on October 21 in Charlotte hospital after an illness of 10 days. He was 54.

Born on November 8, 1896, in New Bedford, Mass, Mr Potter spent his early years in Valleyfield, Quebec. At McGill University, he was an outstanding hockey player and was, at one time, a member of the Canadian Davis Cup tennis team. Following his graduation from McGill, he enlisted in the Royal Canadian Air Force and served as a pilot and lieutenant in World War I, during which he was wounded several times in his three years overseas.

Upon his return to the United States, Mr Potter became connected with the Roessler & Hasslacher Chemical Company, which was later absorbed by the Chemical Division of E I du Pont de Nemours & Co, Inc. He spent fifteen years with du Pont at Perth Amboy, N J, and later in Charlotte, where he came to live in 1928.

Mr Potter was a member of the Covenant Presbyterian Church, Phi Psi Fraternity and the Myers Park Club.

Surviving are his wife, daughter and two brothers.

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Volume 40

January, 1951-December, 1951

Including the Index to PROCEEDINGS OF THE AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

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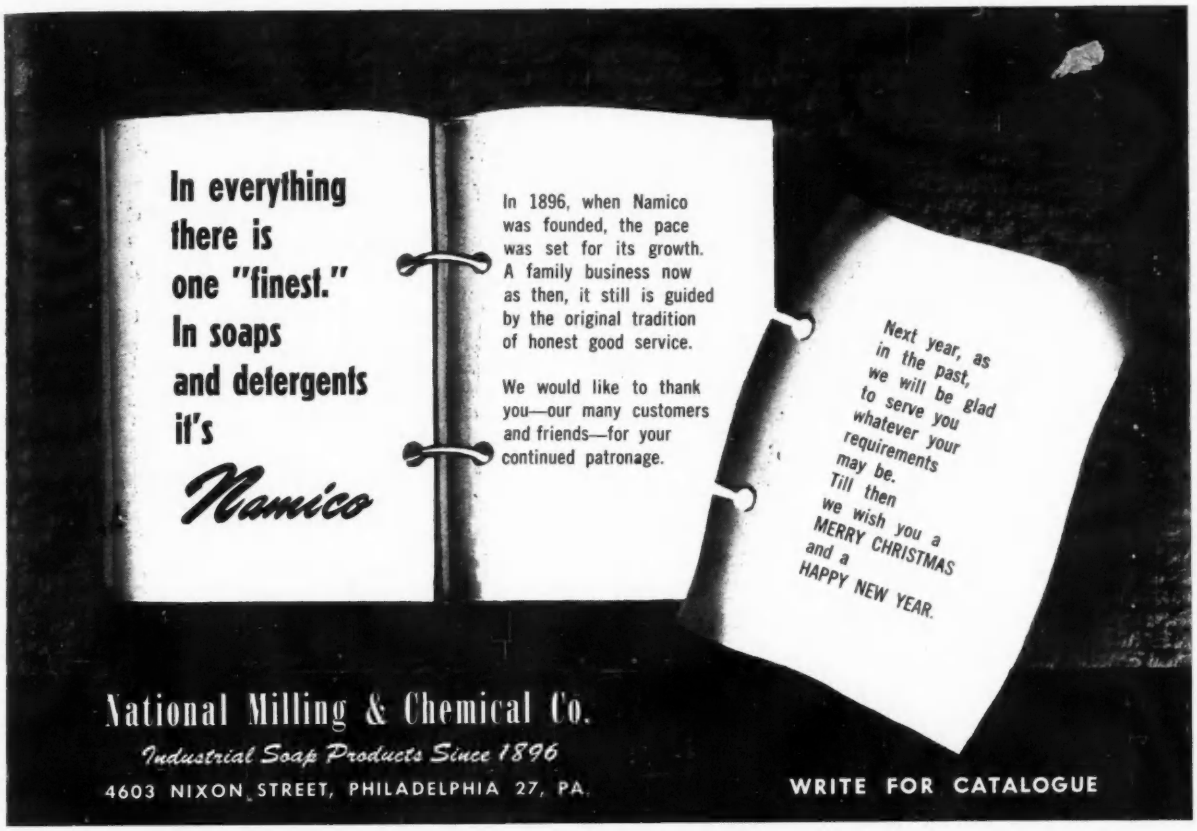
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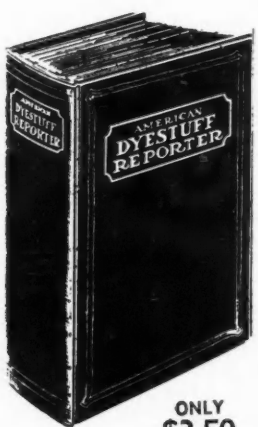

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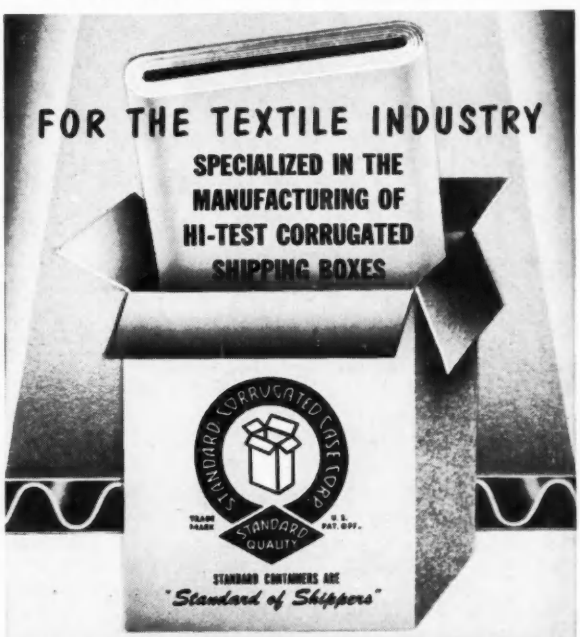

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"Come 'ere, you!" said Cal Gon, as he snapped up another iron ion and came up for a breather. He shoved a couple of surface bubbles aside just in time to hear the brash new chemist say,

"Hey, Chief! Your troubles are over!"

"Turn blue!" said the Old Man, who had a couple of jive-minded kids besides his other troubles.

"Not me, Chief," said the chemist. "But this batch of fabric will. This batch is going to be as blue and clear as a mid-summer sky."

"Don't take any bets on it, son," said the Old Man. "Our luck hasn't been so good lately. And if the colors don't start coming a little better around here pretty soon, there's going to be a house-cleaning."

Well, the chemist never batted an eye. In fact, he kind of laughed.

"That's all past history," he said. "I found out you didn't use Calgon* here. So I ordered some."

"Waddaya mean, we don't use phosphate?" roared the Old Man.

"Didn't say that. I said you didn't use Calgon," replied the chemist.

"Calgon, phosphate. Phosphate, Calgon. What's the difference!" said the Old Man.

"Oh, a couple of pennies of cost . . . and maybe a few hundred dollars of results," said the chemist. "Or maybe I should say—just quality. You see, this Calgon outfit specializes in water conditioning. They are the fussiest people I know when it comes to purity of product. So I've recommended Calgon. We'll get better rinsing, better dye dispersion, better scouring. Chief, *everything's* going to be better—including our finished fabrics and our reject record!"

Cal Gon was ready to burst, he was so full of pride . . . and iron ions. He had to get out of there, so he just submerged.

Next time he heard the Old Man and the chemist talking, the Old Man was saying,

"Son, it all worked out just like you said. We need more of your kind around here. Son, there'll always be a place for you here. And for Calgon, too. You're going to go a long way this coming year, Son. Happy New Year!"

Calgon is the registered trade mark of Calgon, Inc., for its vitreous sodium phosphate products.

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